

# CAREER IDEAS for teens in

## information technology



Diane Lindsey Reeves  
with Gail Karlitz and Don Rauf

**career  
ideas  
for  
teens**

**in  
information  
technology**

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with Gail Karlitz and Don Rauf**

Ferguson  
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## **Career Ideas for Teens in Information Technology**

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**career  
ideas  
for  
teens**

# welcome to your future

**Q: What's one of the most boring  
questions adults ask teens?**

**A: "So . . . what do you want to  
be when you grow up?"**

Well-meaning adults always seem so interested in what you plan to be.

You, on the other hand, are just trying to make it through high school in one piece.

But you may still have a nagging feeling that you really need to find some direction and think about what you want to do with your life.

When it comes to choosing your life's work there's some good news and some bad news. The good news is that, according to the U.S. Bureau of Labor Statistics, you have more than 12,000 different occupations to choose from. With that many options there's got to be something that's just right for you.

Right?

Absolutely.

But . . .

Here comes the bad news.

THERE ARE MORE THAN 12,000 DIFFERENT OCCUPATIONS TO CHOOSE FROM!

How in the world are you ever going to figure out which one is right for you?

We're so glad you asked!

Helping high school students like you make informed choices about their future is what this book (and each of the other titles in the *Career Ideas for Teens* series) is all about. Here you'll encounter 10 tough questions designed to help you answer the biggest one of all: "What in the world am I going to do after I graduate from high school?"



The *Career Ideas for Teens* series enables you to expand your horizons beyond the “doctor, teacher, lawyer” responses common to those new to the career exploration process. The books provide a no-pressure introduction to real jobs that real people do. And they offer a chance to “try on” different career options before committing to a specific college program or career path. Each title in this series is based on one of the 16 career clusters established by the U.S. Department of Education.

And what is a career cluster, you ask? Career clusters are based on a simple and very useful concept. Each cluster consists of all entry-level through professional-level occupations in a broad industry area. All of the jobs and industries in a cluster have many things in common. This organizational structure makes it easier for people like you to get a handle on the big world of work. So instead of rushing headlong into a mind-boggling exploration of the entire universe of career opportunities, you get a chance to tiptoe into smaller, more manageable segments first.

We've used this career cluster concept to organize the *Career Ideas for Teens* series of books. For example, careers related to the arts, communication, and entertainment are organized or “clustered” into the *Career Ideas for Teens in the Arts and Communications* title; a wide variety of health care professions are included in *Career Ideas for Teens in Health Science*; and so on.

Clueless as to what some of these industries are all about? Can't even imagine how something like manufacturing or public administration could possibly relate to you?

No problem.

You're about to find out. Just be prepared to expect the unexpected as you venture out into the world of work. There are some pretty incredible options out there, and some pretty surprising ones too. In fact, it's quite possible that you'll discover that the ideal career for you is one you had never heard of before.

Whatever you do, don't cut yourself short by limiting yourself to just one book in the series. You may find that your initial interests guide you towards the health sciences field—which would, of course, be a good place to start. However, you may discover some new “twists” with a look through the arts and communications book. There you may find a way to blend your medical interests with your exceptional writing and speaking skills by considering becoming a public relations (PR) specialist for a hospital or pharmaceutical company. Or look at the book on education to see about becoming a public health educator or school nurse.

Before you get started, you should know that this book is divided into three sections, each representing an important step toward figuring out what to do with your life.

**The first eight titles in the  
*Career Ideas for Teens*  
series focus on:**

- Architecture and Construction
- Arts and Communications
- Education and Training
- Government and Public Service
- Health Science
- Information Technology
- Law and Public Safety
- Manufacturing

# Before You Get Started

Unlike most books, this one is meant to be actively experienced, rather than merely read. Passive perusal won't cut it. Energetic engagement is what it takes to figure out something as important as the rest of your life.

As we've already mentioned, you'll encounter 10 important questions as you work your way through this book. Following each Big Question is an activity designated with a symbol that looks like this:



Every time you see this symbol, you'll know it's time to invest a little energy in your future by getting out your notebook or binder, a pen or pencil, and doing whatever the instructions direct you to do. If this book is your personal property, you can choose to do the activities right in the book. But you still might want to make copies of your finished products to go in a binder so they are all in one place for easy reference.

When you've completed all the activities, you'll have your own personal **Big Question AnswerBook**, a planning guide representing a straightforward and truly effective process you can use throughout your life to make fully informed career decisions.

## discover you at work

This first section focuses on a very important subject: You. It poses four Big Questions that are designed specifically to help you "discover you":

- ❑ Big Question #1: **who are you?**
- ❑ Big Question #2: **what are your interests and strengths?**
- ❑ Big Question #3: **what are your work values?**

Then, using an interest assessment tool developed by the U.S. Department of Labor and implemented with your very vivid imagination, you'll picture yourself doing some of the things that people actually do for their jobs. In other words, you'll start "discovering you at work" by answering the following:

- ❑ Big Question #4: **what's your work personality?**

Unfortunately, this first step is often a misstep for many people. Or make that a “missed” step. When you talk with the adults in your life about their career choices, you’re likely to find that some of them never even considered the idea of choosing a career based on personal preferences and strengths. You’re also likely to learn that if they had it to do over again, this step would definitely play a significant role in the choices they would make.

## explore your options

There’s more than meets the eye when it comes to finding the best career to pursue. There are also countless ways to blend talent or passion in these areas in some rather unexpected and exciting ways. Get ready to find answers to two more Big Questions as you browse through an entire section of career profiles:

- ❑ Big Question #5: **do you have the right skills?**
- ❑ Big Question #6: **are you on the right path?**

## experiment with success

At long last you’re ready to give this thing called career planning a trial run. Here’s where you’ll encounter three Big Questions that will unleash critical decision-making strategies and skills that will serve you well throughout a lifetime of career success.

While you’re at it, take some time to sit in on a roundtable discussion with successful professionals representing a very impressive array of careers related to this industry. Many of their experiences will apply to your own life, even if you don’t plan to pursue the same careers.

- ❑ Big Question #7: **who knows what you need to know?**
- ❑ Big Question #8: **how can you find out what a career is really like?**
- ❑ Big Question #9: **how do you know when you've made the right choice?**

Then as you begin to pull all your new insights and ideas together, you’ll come to one final question:

- ❑ Big Question #10: **what's next?**

As you get ready to take the plunge, remember that this is a book about possibilities and potential. You can use it to make the most of your future work!



### Here's what you'll need to complete the Big Question AnswerBook:

- A notebook or binder for the completed activities included in all three sections of the book
- An openness to new ideas
- Complete and completely candid answers to the 10 Big Question activities

So don't just read it, do it.  
Plan it.  
Dream it.

# SECTION 1

# discover you at work

**T**he goal here is to get some clues about who you are and what you should do with your life.

As time goes by, you will grow older, become more educated, and have more experiences, but many things that truly define you are not likely to change. Even now you possess very strong characteristics—genuine qualities that mark you as the unique and gifted person that you undoubtedly are.

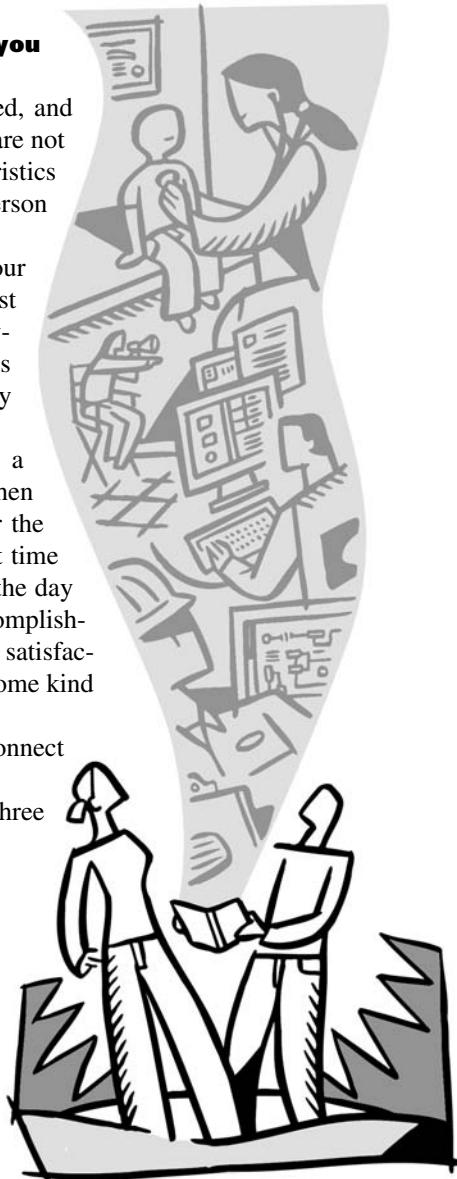
It's impossible to overestimate the importance of giving your wholehearted attention to this step. You, after all, are the most valuable commodity you'll ever have to offer a future employer. Finding work that makes the most of your assets often means the difference between enjoying a rewarding career and simply earning a paycheck.

You've probably already experienced the satisfaction of a good day's work. You know what we mean—those days when you get all your assignments in on time, you're prepared for the pop quiz your teacher sprung on you, and you beat your best time during sports practice. You may be exhausted at the end of the day but you can't help but feel good about yourself and your accomplishments. A well-chosen career can provide that same sense of satisfaction. Since you're likely to spend upwards of 40 years doing some kind of work, well-informed choices make a lot of sense!

Let's take a little time for you to understand yourself and connect what you discover about yourself to the world of work.

To find a career path that's right for you, we'll tackle these three Big Questions first:

- **who are you?**
- **what are your interests and strengths?**
- **what are your work values?**



# Big Question #1: **who are you?**

**H**ave you ever noticed how quickly new students in your school or new families in your community find the people who are most like them? If you've ever been the "new" person yourself, you've probably spent your first few days sizing up the general population and then getting in with the people who dress in clothes a lot like yours, appreciate the same style of music, or maybe even root for the same sports teams.

Given that this process happens so naturally—if not necessarily on purpose—it should come as no surprise that many people lean toward jobs that surround them with people most like them. When people with common interests, common values, and complementary talents come together in the workplace, the results can be quite remarkable.

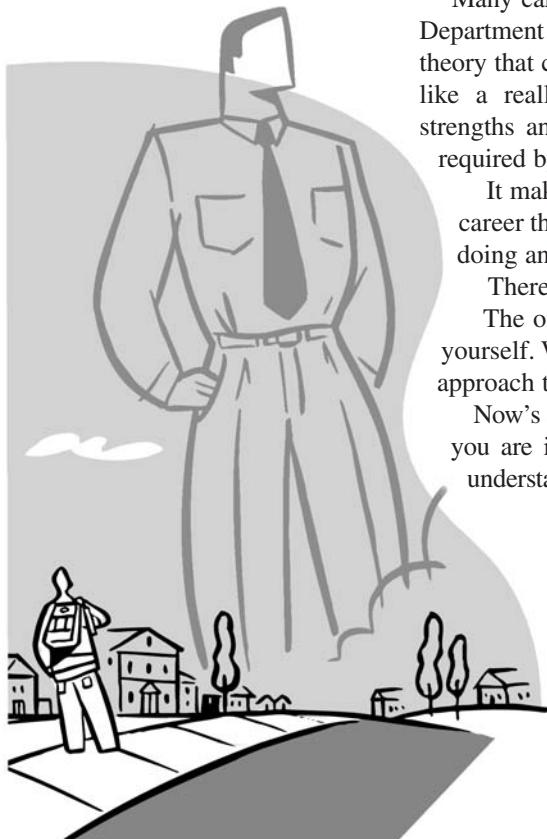
Many career aptitude tests, including the one developed by the U.S. Department of Labor and included later in this book, are based on the theory that certain types of people do better at certain types of jobs. It's like a really sophisticated matchmaking service. Take your basic strengths and interests and match them to the strengths and interests required by specific occupations.

It makes sense when you think about it. When you want to find a career that's ideally suited for you, find out what people like you are doing and head off in that direction!

There's just one little catch.

The only way to recognize other people like you is to recognize yourself. Who are you anyway? What are you like? What's your basic approach to life and work?

Now's as good a time as any to find out. Let's start by looking at who you are in a systematic way. This process will ultimately help you understand how to identify personally appropriate career options.





## Big Activity #1: **who are you?**

On a sheet of paper, if this book doesn't belong to you, create a list of adjectives that best describe you. You should be able to come up with at least 15 qualities that apply to you. There's no need to make judgments about whether these qualities are good or bad. They just are. They represent who you are and can help you understand what you bring to the workforce.

(If you get stuck, ask a trusted friend or adult to help describe especially strong traits they see in you.)

Some of the types of qualities you may choose to include are:

- **How you relate to others:**

Are you shy? Outgoing? Helpful? Dependent? Empathic? In charge? Agreeable? Challenging? Persuasive? Popular? Impatient? A loner?

- **How you approach new situations:**

Are you adventurous? Traditional? Cautious? Enthusiastic? Curious?

- **How you feel about change—planned or unplanned:**

Are you resistant? Adaptable? Flexible? Predictable?

- **How you approach problems:**

Are you persistent? Spontaneous? Methodical? Creative? Analytical?

- **How you make decisions:**

Are you intuitive? Logical? Emotional? Practical? Systematic? Analytical?

- **How you approach life:**

Are you laid back? Ambitious? Perfectionist? Idealistic? Optimistic? Pessimistic? Self-sufficient?

Feel free to use any of these words if they happen to describe you well, but please don't limit yourself to this list. Pick the best adjectives that paint an accurate picture of the real you. Get more ideas from a dictionary or thesaurus if you'd like.

When you're finished, put the completed list in your Big Question AnswerBook.

**Big Activity #1: who are you?**

<b>fifteen qualities that describe me</b>		
<b>1</b>	<b>2</b>	<b>3</b>
<b>4</b>	<b>5</b>	<b>6</b>
<b>7</b>	<b>8</b>	<b>9</b>
<b>10</b>	<b>11</b>	<b>12</b>
<b>13</b>	<b>14</b>	<b>15</b>
<b>etc.</b>		

# Big Question #2: **what are your interests and strengths?**

**F**or many people, doing something they like to do is the most important part of deciding on a career path—even more important than how much money they can earn!

We don't all like to do the same things—and that's good. For some people, the ideal vacation is lying on a beach, doing absolutely nothing; others would love to spend weeks visiting museums and historic places. Some people wish they had time to learn to skydive or fly a plane; others like to learn to cook gourmet meals or do advanced math.

If we all liked the same things, the world just wouldn't work very well. There would be incredible crowds in some places and ghost towns in others. Some of our natural resources would be overburdened; others would never be used. We would all want to eat at the same restaurant, wear the same outfit, see the same movie, and live in the same place. How boring!

So let's get down to figuring out what you most like to do and how you can spend your working life doing just that. In some ways your answer to this question is all you really need to know about choosing a career, because the people who enjoy their work the most are those who do something they enjoy. We're not talking rocket science here. Just plain old common sense.



Big Activity # 2:  
**what are your interests  
and strengths?**

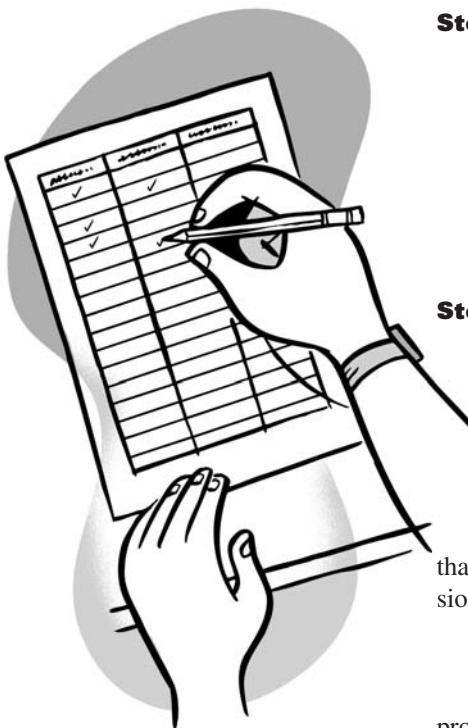
Imagine this: No school, no job, no homework, no chores, no obligations at all. All the time in the world you want to do all the things you like most. You know what we're talking about—those things that completely grab your interest and keep you engrossed for hours without you getting bored. Those kinds of things you do really well—sometimes effortlessly, sometimes with extraordinary (and practiced) skill.

And, by the way, EVERYONE has plenty of both interests and strengths. Some are just more visible than others.

**Step 1:** Write the three things you most enjoy doing on a sheet of paper, if this book doesn't belong to you. Leave lots of space after each thing.

**Step 2:** Think about some of the deeper reasons why you enjoy each of these activities—the motivations beyond “it's fun.” Do you enjoy shopping because it gives you a chance to be with your friends? Because it allows you to find new ways to express your individuality? Because you enjoy the challenge of finding bargains or things no one else has discovered? Or because it's fun to imagine the lifestyle you'll be able to lead when you're finally rich and famous? In the blank spaces, record the reasons why you enjoy each activity.

**Step 3:** Keep this list handy in your Big Question AnswerBook so that you can refer to it any time you have to make a vocational decision. Sure, you may have to update the list from time to time as your interests change. But one thing is certain. The kind of work you'll most enjoy will be linked in some way to the activities on that list. Count on it.



Maybe one of your favorite things to do is “play basketball.” Does that mean the only way you'll ever be happy at work is to play professional basketball?

Maybe.

Maybe not.

Use your *why* responses to read between the lines. The *whys* can prove even more important than the *whats*. Perhaps what you like most about playing basketball is the challenge or the chance to be part of a team that shares a common goal. Maybe you really like pushing yourself to improve. Or it could be the rush associated with competition and the thrill of winning.

The more you uncover your own *whys*, the closer you'll be to discovering important clues about the kinds of work that are best for you.

**Big Activity #2: what are your interests and strengths?**

<b>things you enjoy doing</b>	<b>why you enjoy doing them</b>
1	• • •
2	• • •
3	• • •



## Big Question #3: **what are your work values?**

**C**hances are, you've never given a moment's thought to this next question. At least not in the context of career planning.

You already looked at who you are and what you enjoy and do well. The idea being, of course, to seek out career options that make the most of your innate qualities, preferences, and natural abilities.

As you start checking into various careers, you'll discover one more dimension associated with making personally appropriate career choices. You'll find that even though people may have the exact same job title, they may execute their jobs in dramatically different ways. For instance, everyone knows about teachers. They teach things to other people. Period.

But wait. If you line up 10 aspiring teachers in one room, you may be surprised to discover how vastly different their interpretations of the job may be. There are the obvious differences, of course. One may want to teach young children; one may want to teach adults. One will focus on teaching math, while another one focuses on teaching Spanish.

Look a little closer and you'll find even greater disparity in the choices they make. One may opt for the prestige (and paycheck) of working in an Ivy League college, while another is completely committed to teaching disadvantaged children in a remote area of the Appalachian Mountains. One may approach teaching simply as a way to make a living, while another devotes almost every waking hour to working with his or her students.

These subtle but significant differences reflect what's truly important to each person. In a word, they reflect the person's values—those things that are most important to them.

People's values depend on many factors—their upbringing, their life experiences, their goals and ambitions, their religious beliefs, and, quite frankly, the way they view the world and their role in it. Very few people share exactly the same values. However, that doesn't necessarily mean that some people are right and others are wrong. It just means they have different perspectives.

## **Here's a story that shows how different values can be reflected in career choices.**

Imagine: It's five years after college graduation and a group of college friends are back together for the first time. They catch up about their lives, their families, and their careers. Listen in on one of their reunion conversations and see if you can guess what each is doing now.

**Alice:** I have the best career. Every day I get the chance to help kids with special needs get a good education.

**Bob:** I love my career, too. It's great to know that I am making my town a safer place for everyone.

**Cathy:** It was tough for me to commit to more school after college. But I'm glad I did. After all I went through when my parents divorced, I'm glad I can be there to make things easier for other families.

**David:** I know how you feel. I'm glad I get to do something that helps companies function smoothly and keep our economy strong. Of course, you remember that I had a hard time deciding whether to pursue this career or teaching! This way I get the best of both worlds.

**Elizabeth:** It's great that we both ended up in the corporate world. You know that I was always intrigued by the stock market.

So exactly what is each of the five former freshman friends doing today? Have you made your guesses?

Alice is a lawyer. She specializes in education law. She makes sure that school districts provide special needs children with all of the resources they are entitled to under the law.

Bob is a lawyer. He is a prosecuting attorney and makes his town safer by ensuring that justice is served when someone commits a crime.

Cathy is a lawyer. She practices family law. She helps families negotiate separation and divorce agreements and makes sure that adoption and custody proceedings protect everyone involved. Sometimes she even provides legal intervention to protect adults or children who are in abusive situations.

David is a lawyer. He practices employment law. He helps companies set up policies that follow fair employment practices. He also gives seminars to managers, teaching them what the law says and means about sexual harassment, discrimination, and termination of employment.

Elizabeth is a lawyer. She practices corporate law and is indispensable to corporations with legal responsibilities towards stockholders and the government.

Wow! All five friends have the same job title. But each describes his/her job so differently! All five were able to enter the field of law and focus on the things that are most important to them: quality education, freedom from crime, protection of families and children, fairness in the workplace, and corporate economic growth. Identifying and honoring your personal values is an important part of choosing your life's work.



Big Activity #3:

## **what are your work values?**

**Step 1:** Look at the following chart. If this book doesn't belong to you, divide a sheet of paper into the following three columns:

- **Essential**

Statements that fall into this column are very important to you. If the job doesn't satisfy these needs, you're not interested.

- **Okay**

Great if the job satisfies these needs, but you can also live without them.

- **No Way**

Statements that fall into this column represent needs that are not at all important to you or things you'd rather do without or simply couldn't tolerate.

**Step 2:** Look over the following list of statements representing different work values. Rewrite each statement in the appropriate column. Does the first statement represent something that is critical to you to have in your work? If so, write it in the first column. No big deal either way? Write it in the second column. Couldn't stand it? Write it in the third column. Repeat the same process for each of the value statements.

**Step 3:** When you're finished, place your complete work values chart in your Big Question AnswerBook.

Got it? Then get with it.

Really think about these issues. Lay it on the line. What values are so deeply ingrained in you that you'd be absolutely miserable if you had to sacrifice them for a job? Religious beliefs and political leanings fall into this category for some people.

Which ones provide room for some give and take? Things like vacation and benefits, working hours, and other issues along those lines may be completely negotiable for some people, but absolutely not for others.

Just remember, wherever you go and whatever you do, be sure that the choices you make are true to you.

### Big Activity #3: **what are your work values?**

<b>work values</b>	<b>essential</b>	<b>okay</b>	<b>no way</b>
<p>1. I can count on plenty of opportunity for advancement and taking on more responsibility.</p> <p>2. I can work to my fullest potential using all of my abilities.</p> <p>3. I would be able to give directions and instructions to others.</p> <p>4. I would always know exactly what my manager expects of me.</p> <p>5. I could structure my own day.</p> <p>6. I would be very busy all day.</p> <p>7. I would work in attractive and pleasant surroundings.</p> <p>8. My coworkers would be people I might choose as friends.</p> <p>9. I would get frequent feedback about my performance.</p> <p>10. I could continue my education to progress to an even higher level job.</p> <p>11. Most of the time I would be able to work alone.</p> <p>12. I would know precisely what I need to do to succeed at the job.</p> <p>13. I could make decisions on my own.</p>	<b>ESSENTIAL</b>	<b>OKAY</b>	<b>NO WAY</b>

### Big Activity #3: **what are your work values?**

<b>work values</b>	<b>essential</b>	<b>okay</b>	<b>no way</b>
<p>14. I would have more than the usual amount of vacation time.</p> <p>15. I would be working doing something I really believe in.</p> <p>16. I would feel like part of a team.</p> <p>17. I would find good job security and stable employment opportunities in the industry.</p> <p>18. I could depend on my manager for the training I need.</p> <p>19. I would earn lots of money.</p> <p>20. I would feel a sense of accomplishment in my work.</p> <p>21. I would be helping other people.</p> <p>22. I could try out my own ideas.</p> <p>23. I would not need to have further training or education to do this job.</p> <p>24. I would get to travel a lot.</p> <p>25. I could work the kind of hours I need to balance work, family, and personal responsibilities.</p>	<b>ESSENTIAL</b>	<b>OKAY</b>	<b>NOWAY</b>

To summarize in my own words, the work values most important to me include:

# Big Question #4: **what is your work personality?**

**C**ongratulations. After completing the first three activities, you've already discovered a set of skills you can use throughout your life. Basing key career decisions on factors associated with who you are, what you enjoy and do well, and what's most important about work will help you today as you're just beginning to explore the possibilities, as well as into the future as you look for ways to cultivate your career.

Now that you've got that mastered, let's move on to another important skill. This one blends some of what you just learned about yourself with what you need to learn about the real world of work. It's a reality check of sorts as you align and merge your personal interests and abilities with those required in different work situations. At the end of this task you will identify your personal interest profile.

This activity is based on the work of Dr. John Holland. Dr. Holland conducted groundbreaking research that identified different characteristics in people. He found that he could classify people into six basic groups based on which characteristics tended to occur at the same time. He also found that the characteristics that defined the different groups of people were also characteristics that corresponded to success in different groups of occupations. The result of all that work was a classification system that identifies and names six distinct groups of people who share personal interests or characteristics and are likely to be successful in a group of clearly identified jobs.

Dr. Holland's work is respected by workforce professionals everywhere and is widely used by employers and employment agencies to help people get a handle on the best types of work to pursue.

The following Work Interest Profiler (WIP) is based on Dr. Holland's theories and was developed by the U.S. Department of Labor's Employment and Training Administration as part of an important project called O\*Net. O\*Net is a system used in all 50 states to provide career and employment services to thousands of people every year. It's a system you'll want to know about when it's time to take that first plunge into the world of work. If you'd like, you can find more information about this system at <http://online.onetcenter.org>.



## Big Activity #4: **what is your work personality?**

By completing O\*Net's Work Interest Profiler (WIP), you'll gain valuable insight into the types of work that are right for you.

### **here's how it works**

The WIP lists many activities that real people do at real jobs. Your task is to read a brief statement about each of these activities and decide if it is something you think you'd enjoy doing. Piece of cake!

Don't worry about whether you have enough education or training to perform the activity. And, for now, forget about how much money you would make performing the activity.

Just boil it down to whether or not you'd like performing each work activity. If you'd like it, put a check in the *like* column that corresponds to each of the six interest areas featured in the test on the handy dandy chart you're about to create (or use the one in the book if it's yours). If you don't like it, put that check in the *dislike* column. What if you don't have a strong opinion on a particular activity? That's okay. Count that one as *unsure*.

Be completely honest with yourself. No one else is going to see your chart. If you check things you think you "should" check, you are not helping yourself find the career that will make you happy.

Before you start, create a chart for yourself. Your scoring sheet will have six horizontal rows and three vertical columns. Label the six rows as Sections 1 through 6, and label the three columns *like*, *dislike*, and *unsure*.

	Like	Dislike	Unsure
1	✓		
2	✓		
3		✓	
4			✓
5	✓		
6			✓

### **how to complete the Work Interest Profiler**

**Step 1:** Start with Section 1.

**Step 2:** Look at the first activity and decide whether you would like to do it as part of your job.

**Step 3:** Put a mark in the appropriate column (*Like*, *Dislike*, or *Unsure*) on the Section 1 row.

**Step 4:** Continue for every activity in Section 1. Then do Sections 2 through 6.

**Step 5:** When you've finished all of the sections, count the number of marks you have in each column and write down the total.

Remember, this is not a test! There are no right or wrong answers. You are completing this profile to learn more about yourself and your work-related interests.

Also, once you've completed this activity, be sure to put your chart and any notes in your Big Question AnswerBook.

# Ready? Let's go!

## Section 1

1. Drive a taxi
2. Repair household appliances
3. Catch fish as a member of a fishing crew
4. Paint houses
5. Assemble products in a factory
6. Install flooring in houses
7. Perform lawn care services
8. Drive a truck to deliver packages to homes and offices
9. Work on an offshore oil-drilling rig
10. Put out forest fires
11. Fix a broken faucet
12. Refinish furniture
13. Guard money in an armored car
14. Lay brick or tile
15. Operate a dairy farm
16. Raise fish in a fish hatchery
17. Build a brick walkway
18. Enforce fish and game laws
19. Assemble electronic parts
20. Build kitchen cabinets
21. Maintain the grounds of a park
22. Operate a motorboat to carry passengers
23. Set up and operate machines to make products
24. Spray trees to prevent the spread of harmful insects
25. Monitor a machine on an assembly line

## Section 2

1. Study space travel
2. Develop a new medicine
3. Study the history of past civilizations
4. Develop a way to better predict the weather
5. Determine the infection rate of a new disease
6. Study the personalities of world leaders
7. Investigate the cause of a fire
8. Develop psychological profiles of criminals
9. Study whales and other types of marine life
10. Examine blood samples using a microscope
11. Invent a replacement for sugar
12. Study genetics
13. Do research on plants or animals
14. Study weather conditions
15. Investigate crimes
16. Study ways to reduce water pollution
17. Develop a new medical treatment or procedure
18. Diagnose and treat sick animals
19. Conduct chemical experiments
20. Study rocks and minerals
21. Do laboratory tests to identify diseases
22. Study the structure of the human body
23. Plan a research study
24. Study the population growth of a city
25. Make a map of the bottom of the ocean

## Section 3

1. Paint sets for a play
2. Create special effects for movies
3. Write reviews of books or movies
4. Compose or arrange music
5. Design artwork for magazines
6. Pose for a photographer
7. Create dance routines for a show
8. Play a musical instrument
9. Edit movies
10. Sing professionally
11. Announce a radio show
12. Perform stunts for a movie or television show
13. Design sets for plays
14. Act in a play
15. Write a song
16. Perform jazz or tap dance
17. Sing in a band
18. Direct a movie
19. Write scripts for movies or television shows
20. Audition singers and musicians for a musical show
21. Conduct a musical choir
22. Perform comedy routines in front of an audience
23. Dance in a Broadway show
24. Perform as an extra in movies, plays, or television shows
25. Write books or plays

## **Section 4**

1. Teach children how to play sports
2. Help people with family-related problems
3. Teach an individual an exercise routine
4. Perform nursing duties in a hospital
5. Help people with personal or emotional problems
6. Teach work and living skills to people with disabilities
7. Assist doctors in treating patients
8. Work with juveniles on probation
9. Supervise the activities of children at a camp
10. Teach an elementary school class
11. Perform rehabilitation therapy
12. Help elderly people with their daily activities
13. Help people who have problems with drugs or alcohol
14. Teach a high school class
15. Give career guidance to people
16. Do volunteer work at a non-profit organization
17. Help families care for ill relatives
18. Teach sign language to people with hearing disabilities
19. Help people with disabilities improve their daily living skills
20. Help conduct a group therapy session
21. Work with children with mental disabilities
22. Give CPR to someone who has stopped breathing
23. Provide massage therapy to people
24. Plan exercises for patients with disabilities
25. Counsel people who have a life-threatening illness

## **Section 5**

1. Sell CDs and tapes at a music store
2. Manage a clothing store
3. Sell houses
4. Sell computer equipment in a store
5. Operate a beauty salon or barber shop
6. Sell automobiles
7. Represent a client in a lawsuit
8. Negotiate business contracts
9. Sell a soft drink product line to stores and restaurants
10. Start your own business
11. Be responsible for the operations of a company
12. Give a presentation about a product you are selling
13. Buy and sell land
14. Sell restaurant franchises to individuals
15. Manage the operations of a hotel
16. Negotiate contracts for professional athletes
17. Sell merchandise at a department store
18. Market a new line of clothing
19. Buy and sell stocks and bonds
20. Sell merchandise over the telephone
21. Run a toy store
22. Sell hair-care products to stores and salons
23. Sell refreshments at a movie theater
24. Manage a retail store
25. Sell telephone and other communication equipment

## **Section 6**

1. Develop an office filing system
2. Generate the monthly payroll checks for an office
3. Proofread records or forms
4. Schedule business conferences
5. Enter information into a database
6. Photocopy letters and reports
7. Keep inventory records
8. Record information from customers applying for charge accounts
9. Load computer software into a large computer network
10. Use a computer program to generate customer bills
11. Develop a spreadsheet using computer software
12. Operate a calculator
13. Direct or transfer office phone calls
14. Use a word processor to edit and format documents
15. Transfer funds between banks, using a computer
16. Compute and record statistical and other numerical data
17. Stamp, sort, and distribute office mail
18. Maintain employee records
19. Record rent payments
20. Keep shipping and receiving records
21. Keep accounts payable/receivable for an office
22. Type labels for envelopes and packages
23. Calculate the wages of employees
24. Take notes during a meeting
25. Keep financial records

*Section 1*  
**Realistic**

	Like	Dislike	Unsure
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			

**Total Realistic**

*Section 2*  
**Investigative**

	Like	Dislike	Unsure
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			

**Total Investigative**

*Section 3*  
**Artistic**

	Like	Dislike	Unsure
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			

**Total Artistic**

*Section 4*  
**Social**

	Like	Dislike	Unsure
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
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17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			

**Total Social**

## *Section 5* **Enterprising**

	Like	Dislike	Unsure
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			

**Total Enterprising**

## *Section 6* **Conventional**

	Like	Dislike	Unsure
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			

**Total Conventional**

**W**hat are your top three work personalities? List them here if this is your own book or on a separate piece of paper if it's not.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

## **all done? let's see what it means**

Be sure you count up the number of marks in each column on your scoring sheet and write down the total for each column. You will probably notice that you have a lot of *likes* for some sections, and a lot of *dislikes* for other sections. The section that has the most *likes* is your primary interest area. The section with the next highest number of *likes* is your second interest area. The next highest is your third interest area.

Now that you know your top three interest areas, what does it mean about your work personality type? We'll get to that in a minute, but first we are going to answer a couple of other questions that might have crossed your mind:

- What is the best work personality to have?
- What does my work personality mean?

First of all, there is no “best” personality in general. There is, however, a “best” personality for each of us. It’s who we really are and how we feel most comfortable. There may be several “best” work personalities for any job because different people may approach the job in different ways. But there is no “best work personality.”

Asking about the “best work personality” is like asking whether the “best” vehicle is a sports car, a sedan, a station wagon, or a sports utility vehicle. It all depends on who you are and what you need.

One thing we do know is that our society needs all of the work personalities in order to function effectively. Fortunately, we usually seem to have a good mix of each type.

So, while many people may find science totally boring, there are many other people who find it fun and exciting. Those are the people who invent new technologies, who become doctors and researchers, and who turn natural resources into the things we use every day. Many people may think that spending a day with young children is unbearable, but those who love that environment are the teachers, community leaders, and museum workers that nurture children’s minds and personalities.

When everything is in balance, there’s a job for every person and a person for every job.

Now we’ll get to your work personality. Following are descriptions of each of Dr. Holland’s six work personalities that correspond to the six sections in your last exercise. You, like most people, are a unique combination of more than one. A little of this, a lot of that. That’s what makes us interesting.

Identify your top three work personalities. Also, pull out your responses to the first three exercises we did. As you read about your top three work personalities, see how they are similar to the way you described yourself earlier.



## Type 1 **Realistic**

Realistic people are often seen as the “Doers.” They have mechanical or athletic ability and enjoy working outdoors.

Realistic people like work activities that include practical, hands-on problems and solutions. They enjoy dealing with plants, animals, and real-life materials like wood, tools, and machinery.

Careers that involve a lot of paperwork or working closely with others are usually not attractive to realistic people.

### **Who you are:**

- independent
- reserved
- practical
- mechanical
- athletic
- persistent

### **What you like to do/what you do well:**

- build things
- train animals
- play a sport
- fix things
- garden
- hunt or fish
- woodworking

repair cars  
refinish furniture

### **Career possibilities:**

- aerospace engineer
- aircraft pilot
- animal breeder
- architect
- baker/chef
- building inspector
- carpenter
- chemical engineer
- civil engineer
- construction manager
- dental assistant
- detective
- glazier
- jeweler
- machinist
- oceanographer
- optician
- park ranger
- plumber
- police officer
- practical nurse
- private investigator
- radiologist
- sculptor



## Type 2 **Investigative**

Investigative people are often seen as the “Thinkers.” They much prefer searching for facts and figuring out problems mentally to doing physical activity or leading other people.

If Investigative is one of your strong interest areas, your answers to the earlier exercises probably matched some of these:

### **Who you are:**

- curious
- logical
- independent
- analytical
- observant
- inquisitive

### **What you like to do/what you do well:**

- think abstractly
- solve problems
- use a microscope
- do research
- fly a plane
- explore new subjects
- study astronomy
- do puzzles
- work with a computer

**Career possibilities:**

aerospace engineer  
archaeologist  
CAD technician  
chemist  
chiropractor  
computer programmer  
coroner  
dentist  
electrician  
ecologist  
geneticist  
hazardous waste technician  
historian  
horticulturist  
management consultant  
medical technologist  
meteorologist  
nurse practitioner  
pediatrician  
pharmacist  
political scientist  
psychologist  
software engineer  
surgeon  
technical writer  
veterinarian  
zoologist

**Type 3  
Artistic**

Artistic people are the “Creators.” People with this primary interest like work activities that deal with the artistic side of things.

Artistic people need to have the opportunity for self-expression in their work. They want to be able to use their imaginations and prefer to work in less structured environments, without clear sets of rules about how things should be done.

**Who you are:**

imaginative  
intuitive  
expressive  
emotional  
creative  
independent

**What you like to do/what  
you do well:**

draw  
paint  
play an instrument  
visit museums  
act  
design clothes or rooms  
read fiction  
travel  
write stories, poetry, or music

**Career possibilities:**

architect  
actor  
animator  
art director  
cartoonist  
choreographer  
costume designer  
composer  
copywriter  
dancer  
disc jockey  
drama teacher  
emcee  
fashion designer  
graphic designer  
illustrator  
interior designer  
journalist  
landscape architect  
medical illustrator  
photographer  
producer  
scriptwriter  
set designer



## Type 4 **Social**

Social people are known as the “Helpers.” They are interested in work that can assist others and promote learning and personal development.

Communication with other people is very important to those in the Social group. They usually do not enjoy jobs that require a great amount of work with objects, machines, or data. Social people like to teach, give advice, help, cure, or otherwise be of service to people.

### **Who you are:**

- friendly
- outgoing
- empathic
- persuasive
- idealistic
- generous

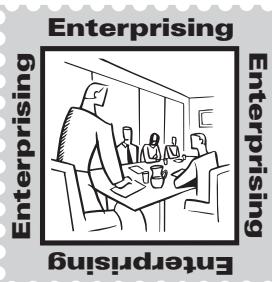
### **What you like to do/what you do well:**

- teach others
- work in groups
- play team sports
- care for children
- go to parties
- help or advise others
- meet new people

express yourself  
join clubs or organizations

### **Career possibilities:**

- animal trainer
- arbitrator
- art teacher
- art therapist
- audiologist
- child care worker
- clergy person
- coach
- counselor/therapist
- cruise director
- dental hygienist
- employment interviewer
- EMT worker
- fitness trainer
- flight attendant
- occupational therapist
- police officer
- recreational therapist
- registered nurse
- school psychologist
- social worker
- substance abuse counselor
- teacher
- tour guide



## Type 5 **Enterprising**

Enterprising work personalities can be called the “Persuaders.” These people like work activities that have to do with starting up and carrying out projects, especially business ventures. They like taking risks for profit, enjoy being responsible for making decisions, and generally prefer action to thought or analysis.

People in the Enterprising group like to work with other people. While the Social group focuses on helping other people, members of the Enterprising group are able to lead, manage, or persuade other people to accomplish the goals of the organization.

### **Who you are:**

- assertive
- self-confident
- ambitious
- extroverted
- optimistic
- adventurous

### **What you like to do/what you do well:**

- organize activities
- sell things
- promote ideas

discuss politics  
hold office in clubs  
give talks or speeches  
meet people  
initiate projects  
start your own business

**Career possibilities:**

advertising  
chef  
coach, scout  
criminal investigator  
economist  
editor  
foreign service officer  
funeral director  
hotel manager  
journalist  
lawyer  
lobbyist  
public relations specialist  
newscaster  
restaurant manager  
sales manager  
school principal  
ship's captain  
stockbroker  
umpire, referee  
urban planner



## Type 6 **Conventional**

People in the Conventional group are the “Organizers.” They like work activities that follow set procedures and routines. They are more comfortable and proficient working with data and detail than they are with generalized ideas.

Conventional people are happiest in work situations where the lines of authority are clear, where they know exactly what responsibilities are expected of them, and where there are precise standards for the work.

**Who you are:**

well-organized  
accurate  
practical  
persistent  
conscientious  
ambitious

### **What you like to do/what you do well:**

work with numbers  
type accurately  
collect or organize things  
follow up on tasks  
be punctual  
be responsible for details  
proofread

keep accurate records  
understand regulations

**Career possibilities:**

accountant  
actuary  
air traffic controller  
assessor  
budget analyst  
building inspector  
chief financial officer  
corporate treasurer  
cost estimator  
court reporter  
economist  
environmental compliance  
lawyer  
fire inspector  
insurance underwriter  
legal secretary  
mathematician  
medical secretary  
proofreader  
tax preparer

## **information technology careers work personality codes**

Once you've discovered your own unique work personality code, you can use it to explore the careers profiled in this book and elsewhere. Do keep in mind though that this code is just a tool meant to help focus your search. It's not meant to box you in or to keep you from pursuing any career that happens to capture your imagination.

Following is a chart listing the work personality codes associated with each of the careers profiled in this book.

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
<b>My Work Personality Code</b> (mark your top three areas)						
Artifical Intelligence Scientist	X			X	X	
Bioinformatician	X	X	X			
CAD (Computer-Aided Design) Technician	X	X			X	
Chief Information Officer		X		X	X	
Computer Animator	X		X		X	
Computer Control Operator	X	X				X
Computer Forensics Expert		X		X	X	
Computer Game Designer	X				X	X
Computer Operator	X			X		X
Computer Programmer	X	X				X
Computer Repair Technician	X	X		X		
Computer Sales Representative	X			X	X	
Computer Science Teacher						
Computer Security Specialist		X		X		X
Computer Support Specialist				X	X	X

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
<b>My Work Personality Code</b>						
Database Administrator	X	X			X	
Database Modeler	X	X			X	
Desktop Publisher	X		X		X	
E-Commerce Administrator		X		X	X	
Global Network Architect	X	X				X
Hardware Engineer	X	X			X	
Information Architect	X	X			X	
Information Broker				X	X	X
Instructional Designer	X			X	X	
Multimedia Developer			X	X	X	
Nanotechnologist	X	X			X	
Semiconductor Processor	X				X	X
Software Developer	X	X			X	
Software Tester	X	X			X	
Systems Analyst	X	X			X	
Technical Writer	X	X			X	
Telecommunications Engineer	X				X	X
Usability Specialist	X			X	X	
Webmaster		X		X	X	
Wireless Engineer		X		X	X	

**N**ow it's time to move on to the next big step. While the first step focused on you, the next one focuses on the world of work. It includes profiles of a wide variety of occupations related to information technology, a round table discussion with professionals working in these fields, and a mind-boggling list of other careers to consider when wanting to blend passion or talent in these areas with your life's work.

# SECTION 2

# explore your options

**B**y now, you probably have a fairly good understanding of the assets (some fully realized and perhaps others only partially developed) that you bring to your future career. You've defined key characteristics about yourself, identified special interests and strengths, examined your work values, and analyzed your basic work personality traits. All in all, you've taken a good, hard look at yourself and we're hoping that you're encouraged by all the potential you've discovered.

You should be ready by now to shift your focus to the workplace. When you do, you'll undoubtedly find computers everywhere you look. Computers have infiltrated virtually every industry and impact—in one way or another—virtually any profession you can imagine. Everyone from auto mechanics to stockbrokers are finding computers to be an essential tool of their trade.



As one of the most computer-savvy generations in history, students like you are likely to use computers in ways your parents never dreamed about. You use them to research papers, write and edit assignments, download the latest music (legally, of course), and keep in constant touch with friends. Unlike your parents, you've probably never had the dubious honor of having to retype an entire paper just to correct a couple of typos. No, you've been much too busy mastering the technological wonders of computers, cell phones, and the Internet.

Even though technology has already revolutionized the workplace and is starting to revolutionize education, the fact of the matter is this: you ain't seen nothing yet! The world has yet to see how far technolo-

## **fyi**

Each of the following profiles includes several common elements to help guide you through an effective career exploration process. For each career, you'll find

- A sidebar loaded with information you can use to find out more about the profession. Professional associations, pertinent reading materials, the low-down on wages and suggested training requirements, and a list of typical types of employers are all included to give you a broader view of what the career is all about.
- An informative essay describing what the career involves.
- Get Started Now strategies you can use right now to get prepared,

test the waters, and develop your skills.

- A **Hire Yourself** project providing realistic activities like those you would actually find on the job. Try these learning activities and find out what it's really like to be a . . . you name it.

You don't have to read the profiles in order. You may want to first browse through the career ideas that appear to be most interesting. Then check out the others—you never know what might interest you when you know more about it. As you read each profile, think about how well it matches up with what you learned about yourself in Section 1: **Discover You at Work**. Narrow down your options to a few careers and use the rating system

described below to evaluate your interest levels.

- **No way!** There's not even a remote chance that this career is a good fit for me. (Since half of figuring out what you do want to do in life involves figuring out what you don't want to do, this is not a bad place to be.)
- **This is intriguing.** I want to learn more about it and look at similar careers as well. (The activities outlined in Section 3: **Experiment with Success** will be especially useful in this regard.)
- **This is it!** It's the career I've been looking for all my life and I want to go after it with all I've got. (Head straight to Section 3: **Experiment with Success**.)

gy will take us. Experts expect a new breed of technology “whizzes” to use the infrastructure already in place as a springboard to solve some of the world’s most perplexing problems.

For those of you with an interest in being a part of this dynamic and consistently amazing industry, there are four main pathways to consider. You’ll find there’s something for just about any skill set—from highly technical to highly creative. The opportunities are truly diverse, with new ones still emerging. Follow these pathways to clues about the best careers for you to pursue. The four information technology pathways include:

### **Programming and Software Development**

Designing, developing, and implementing computer systems and software are all part of the programming and software development pathway. Careers in this pathway require knowledge of computer operating systems, programming languages, and software development. Professionals working in this pathway generally stay a step ahead of the crowd when it comes to making the most of the latest cutting-edge technologies.

Programming and software development careers profiled in this book include computer control operator, software developer, software tester, systems analyst, and usability specialist.

### **Network Systems**

Network systems is a high-demand pathway with opportunities available in all types of 21st-century industries and all sizes of businesses. Work in this field involves analysis, planning, implementation, design, installation, information infrastructure, and maintenance. Technical knowledge, specialized training, and, in some cases, certification in specific types of network systems provide entry and advancement opportunities in this field.

Network systems careers profiled in this book include computer support specialist, global network architect, information architect, telecommunications engineer, and wireless engineer.

### **Information Support and Services**

Professionals working in information support and services bridge the gap between human users and technology. Represented in this pathway are the professionals responsible for tasks like implementing computer systems, installing and customizing software, providing technical assistance, managing information systems, and other tasks related to the high-tech needs of the 21st-century workplace.

Information support and services careers profiled in this book include chief information officer, computer forensics expert, computer operator, computer repair technician, computer sales representative, database administrator, database modeler, e-commerce administrator, and computer security specialist.

### **A Note on Websites**

Websites tend to move around a bit. If you have trouble finding a particular site, use an Internet browser to search for a specific website or type of information.

### **Interactive Media**

People who work in interactive media spend their days creating, designing, and producing a wide variety of multimedia products used in business, entertainment, communications, and marketing. Potential products include digital media found on the World Wide Web and in CD-ROM and DVD formats.

Interactive media careers profiled in this book include CAD technician, computer animator, computer game designer, desktop publisher, instructional designer, multimedia developer, technical writer, and webmaster.

**A**s you explore the 35 careers profiled in this book, remember to keep what you've learned about yourself in mind. Consider each option in light of what you know about your interests, strengths, work values, and work personality.

Pay close attention to the job requirements. Does it require math aptitude? Good writing skills? Ability to take things apart and visualize how they go back together? If you don't have the necessary abilities (and don't have a strong desire to acquire them), you probably won't enjoy the job.

For instance, several popular TV shows make forensic investigation look like a fascinating career. And it is—for some people. But when considering whether forensic investigation—or any career for that matter—is right for you, think about the skills it takes to succeed. In this case, we're talking about lots of chemistry, anatomy, and physics. And, quite frankly, working with dead people. Be realistic about each profession so that you can make an honest assessment about how appropriate it is for you.

# find artificial intelligence your scientist future

## artificial intelligence scientist

When you hear the phrase *artificial intelligence* (AI), the first thing that may come to mind are computers in the movies that think for themselves, and for the most part, carry out evil deeds. In *Terminator 3: Rise of the Machines*, a computer program tries to take over the world; in *The Matrix*, machines enslave humanity; and in the classic *2001: A Space Odyssey*, a computer named HAL tries to take over a spaceship (the name is a reference to IBM—each letter in HAL precedes the *I*, *B*, and *M*.) No computers are as advanced as the ones depicted in films (and none are evil), but computer scientists are making great strides in teaching computers how to “think” and “learn.”

Over the past 50 years, we have seen the science of making intelligent machines expand into all aspects of our lives. Cruise control in our cars operates via a computer that tells vehicles how to change speed

## Get Started Now!

**Captivated by the idea of creating a planet filled with thinking machines? Here are some ways to explore a career in AI.**

- If you’re serious about a career in this area, check out the internships offered by major employers, such as IBM in its IBM Research Summer Intern Program at [www.research.ibm.com/about/career.shtml](http://www.research.ibm.com/about/career.shtml); Microsoft at [www.microsoft.com/college/intern](http://www.microsoft.com/college/intern); and Mitsubishi Electric Research Laboratories at [www.merl.com/employment/intern.html](http://www.merl.com/employment/intern.html).
- Study advanced science and mathematics, especially mathematical logic.
- Learn some programming languages, such as C++ and Java.

**explore your options**



### Search It!

American Association of Artificial Intelligence at [www.aaai.org](http://www.aaai.org)



### Read It!

AI Magazine at [www.aaai.org/Magazine/magazine.html](http://www.aaai.org/Magazine/magazine.html) and Journal of Artificial Intelligence Research at [www.cs.washington.edu/research/jair/home.html](http://www.cs.washington.edu/research/jair/home.html)



### Learn It!

- A four-year degree in computer science with an artificial intelligence focus, or
- A four-year degree in mechanical or electrical engineering with an emphasis on robotics



### Earn It!

Starting annual salary averages \$50,000, while experienced AI professionals earn \$80,000 or more. (Source: *Smart Money* magazine)



### Find It!

Compare opportunities at computer manufacturer and electronic firms like IBM ([www.ibm.com](http://www.ibm.com)) and Intel ([www.intel.com](http://www.intel.com)) with opportunities with research groups like SRI ([www.ai.sri.com](http://www.ai.sri.com)).

## Hire Yourself!

The school board has come to you to get ideas about high-tech schools of the future. They want five ideas for using artificial intelligence to improve learning environments. Come up with five different concepts and use a separate sheet of paper to describe and illustrate each one. Is the world ready for robotic teachers? Or what about chalkboards that automatically erase themselves?

according to the hills and valleys. Modern homes use smart computers to turn on the lights, adjust the temperature, and automatically set alarms. In computer games, artificial intelligence allows the computer to respond to your actions and makes winning more challenging. The technology has become so sophisticated that IBM was able to develop the Deep Blue supercomputer, which beat chess champion Gary Kasparov.

These computers are reacting to different circumstances—responding and making decisions. One of the most sophisticated forms of AI is called data-mining. Data-mining systems sift instantly through reams of information to uncover patterns and relationships that would take human researchers years to discover.

WalMart uses one such system to collect and analyze data regarding sales at all its stores. By looking at purchasing patterns, Wal-Mart can predict sales of every product at each store with uncanny accuracy. Similarly, machines use algorithms (sets of steps for solving particular problems) to learn to detect credit card fraud. Computers mine the data of past transactions and when they spot irregularities, they can automatically prevent use of a credit card. Computers also learn from medical records to discover emerging trends in the spread and treatment of new diseases.

Getting into the field of artificial intelligence requires some very real human intelligence. You need to be a creative problem solver who can think big. You

need an ability to learn sophisticated software programs, such as voice recognition and computer vision programs.

AI scientists explore turning their ideas into reality by doing a lot of research and experimentation. They usually begin by creating a computer “model” that details the entire process they are trying to automate. For instance, a computer now can read lips and translate the lip motions into written words. To accomplish this feat, AI scientists had to write down how they wanted the computer to recognize lip shapes and patterns, and then how those visuals could be transformed into written words.

The AI field is expected to provide many opportunities in the years ahead as “smart” computers are used in almost every field including health care, law, retail sales, security, the military, and entertainment. Every day more ideas that once seemed far-fetched become commonplace. AI represents a new frontier in technology with opportunities waiting for bold IT adventurers.



#### **Search It!**

Bioinformatics.org at [www.bioinformatics.org](http://www.bioinformatics.org)



#### **Read It!**

Bio-IT World at [www.bio-itworld.com/bio/informatics](http://www.bio-itworld.com/bio/informatics), and a bioinformatics primer at <http://www.ncbi.nlm.nih.gov/About/primer/index.html>



#### **Learn It!**

- A bachelor's degree in a biological science, such as biophysics, chemistry, biochemistry, or molecular biology
- A master's degree in bioinformatics



#### **Earn It!**

Average starting salary ranges from \$60,000 to \$90,000.  
(Source: Remington International Recruiting)



#### **Find It!**

Explore opportunities at Bristol-Myers Squibb Company ([www.bms.com](http://www.bms.com)), Abgenix ([www.abgenix.com](http://www.abgenix.com)), and Premier Biosoft International ([www.premierbiosoft.com](http://www.premierbiosoft.com)).

# find bioinformatician your future

## **bioinformatician**

A cutting edge career if ever there was one, bioinformatics combines biology and computer science in complex and fascinating ways. Also known as computational science or computational molecular biology, this field encompasses a very sophisticated integration of life and physical sciences with mathematics, statistics, and computer science.

Bioinformaticians collect, analyze, sort, store, and manage large amounts of biological data. This data includes information on nucleic acid (DNA/RNA), and its protein sequences, structures, functions, pathways, and interactions. Careful analysis of such data can be used to predict the composition or structure of biomolecules and their actions and reactions.

Possibly the greatest achievement in bioinformatics is the Human Genome Project—the complete mapping of the set of genes that create a human being. In terms of magnitude, this scientific accomplishment is on par with putting a man on the moon.

This quantitative science involves enormous collections of gene data, stored at both public repositories like GenBank and Protein DataBank, and in private databases, like those used by research groups involved in gene-mapping projects. As professional analyzers, bioinformaticians

## **Get Started Now!**

### **Prepare for a bioinformatics career.**

- Pfizer, the pharmaceutical company, has a great site for young adults about the genome project at <http://genome.pfizer.com>. Check it out.
- Study science and mathematics, especially mathematical logic.
- Increase your computer comfort level by taking programming and database management courses.

## Hire Yourself!

The National Human Genome Research Institute website provides some very interesting resources about the Human Genome Project and some of the ethical, legal, and social implications associated with this amazing scientific breakthrough. Go on-line to [www.nhgri.nih.gov/Pages/EducationKit](http://www.nhgri.nih.gov/Pages/EducationKit) and choose a module of particular interest to you. Use the information you find there to create a PowerPoint or other type of visual presentation that introduces at least three important concepts related to the Human Genome Project and its potential impact on humans.

mine the data to develop new hypotheses, new models of how biological systems function, and rules and patterns which can be used to review new data sets.

And why, you may ask, do scientists go to such great lengths? The implications for health care in particular are simply astounding. Bioinformatics is helping scientists uncover cures for diseases such as AIDS, cancer, most inherited diseases, and may someday even provide solutions to many health problems associated with aging.

Pharmaceutical companies are using bioinformatics in their quest to develop effective drugs. Bioinformaticians can use computer modeling to predict the effectiveness of specific drugs used to prevent or control certain diseases. For example: a pharmaceutical company developed a drug to treat asthma. The drug proved effective during animal testing, which may or may not mean that it would work with humans suffering from acute asthma attacks. However, testing drugs on humans is time-consuming, expensive, and potentially dangerous. Bioinformatics provides a reliable means to simulate clinical testing using “virtual” patients. In this particular case, the results from the computer simulation cast doubt on the drug’s effectiveness, so the company knew that the drug needed modification before it could be sold as a medication.

Another use of bioinformatics is found in agriculture. Bioinformatics holds great promise as a means to improve genomes related to economically important crops and animals. By analyzing genetic data about plants, scientists can solve problems related to issues like nutritional quality, insect resistance, and drought resistance.

As you may have guessed by now, it takes sharp minds to solve complex problems like these. Getting the education needed to succeed requires an interdisciplinary approach involving study in areas such as biology, computer science, chemistry, and library and information science.



Proficiency in subjects like algebra, calculus, and statistics is a good early indicator of the analytical minds best suited for this type of work.

Once on the job, bioinformaticians can expect to be involved in tasks like analyzing extremely large batches of data related to genomic science. Without the assistance of very sophisticated technology and specialized software, this process could be like finding a needle in a haystack. Technology, however, provides the power to boldly go where no mind has ever gone before. Drawing inferences, developing new statistical methods for making sense of the data, finding answers to questions that have eluded mankind since the beginning of time—it's all in a day's work for bioinformatics scientists.

The demand for bioinformaticians is hot: experts predict the need for bioinformaticians will grow extremely fast in the next 10 years. And high demand commands high salaries—many professionals with three to five years of experience are earning salaries of \$120,000 or more!

# find CAD (computer-aided design) your technician future

## CAD (computer-aided design) technician

Before Lance Armstrong pedaled to victory in the Tour de France, his bicycle had to be specially designed and tested, and through CAD, or computer-aided design, much of that work was done on a computer. CAD technology let designers visualize a 3-D model of Armstrong's bicycle and, by using special programming, engineers could even test the bicycle's aerodynamics—all on the computer screen. From bicycles to machine parts to buildings, CAD gives the ability to produce complex virtual models of almost anything, using true-scale measurements.

CAD (sometimes referred to as CADD, computer-aided design and drafting) has revolutionized the world of drafting, where in the past

### Get Started Now!

**Want to build skyscrapers, automobiles, sneakers, and more on the computer screen? Get started in the world of CAD.**

- Take as much math as possible, especially geometry and algebra.
- Physics provides an especially important introduction to the many forces that come into play when constructing a building. Sign up and study hard!
- Learn your way around computers by taking a variety of courses in computer science and computer graphics.
- Check out the award-winning entries for the CADDIES, *Catalyst* magazine's award program for CAD design, at [www.catalyst.com/catalyst/article/articleDetail.jsp?id=80697](http://www.catalyst.com/catalyst/article/articleDetail.jsp?id=80697), to see designs for structures from airport terminals to government centers to museums.

**explore your options**



#### Search It!

The American Design Drafting Association (ADDA) at  
[www.adda.org](http://www.adda.org)



#### Read It!

*Catalyst* magazine at [www.catalyst.com](http://www.catalyst.com)



#### Learn It!

- A two-year degree in CAD design
- Autodesk lists authorized training centers at [www.usa.autodesk.com](http://www.usa.autodesk.com)
- ADDA lists approved certification programs at [www.adda.org](http://www.adda.org)



#### Earn It!

Median annual salary is \$36,000.  
(Source: U.S. Department of Labor)



#### Find It!

To get an idea of the types of opportunities available to CAD designers, look through the job listings at CAD Job Mart at  
[www.cadjobmart.com](http://www.cadjobmart.com).

## Hire Yourself!

A local college wants to redesign its dorm rooms to accommodate their increasingly tech-savvy students. The architect hired for the job has asked you to come up with some preliminary ideas about essential features for today's college dorm room. Using either a computer or pencil and graph paper, create a diagram depicting your ideas. Be sure to include all the essentials—bed, TV, dresser, lights, electrical outlets, windows, bathroom, refrigerator, closet, desk, and bookshelves.

detailed diagrams were drawn by hand at a drafting table using T-squares. Now CAD technicians input lines, arcs, coordinates, and dimensions into a computer. Once a model is drawn, CAD technicians can easily explore a greater number of design alternatives—reducing design costs and the time it takes to deliver a product to market. This technology is especially applicable in the world of architecture where CAD software is used for drawing floor plans, elevations, sections, 3-D models, photorealistic renderings, and more.

Although it can be used for two-dimensional drawings, CAD is most innovative when it comes to 3-D modeling. Three-dimensional models created with CAD are exact replicas of existing objects or ideas for objects, but they only exist in digital form. With precise measurements and descriptive data of the virtual model, a CAD operator can easily manipulate it, scaling it up or down, modifying its shape, changing its color, and more. Once a digital object has been formed it can then be viewed from multiple angles and in cross sections. CAD detailing can be so precise that the computer images can look super real.

CAD technicians generally have a knack for mathematics—especially geometry. They also need to become experts at basic CAD software. AutoCAD made by Autodesk is arguably the most generic and recognizable CAD product used today. In addition, many CAD operators know traditional drafting techniques, which can be of great value when working with specifications supplied by architects or engineers.

CAD's uses are reaching beyond the expected areas of architecture and engineering. Ford and General Motors, for instance, insist that all their suppliers submit designs in 3-D. Doctors and dentists are using CAD-based software for creating models of the human body. Even the animation in many popular movies starts with CAD-based technology, so the possibilities for CAD technicians appear to be stretching to infinity and beyond!

# find chief information your officer future

## chief information officer

In the business hierarchy, the chief information officer or CIO is the master and commander of all things related to information technology. CIOs lead a company's information technology department, and their primary function is to steer an organization's overall technological course. They oversee the hiring of staff, manage the technology budget, and typically work with other managers on corporate strategy.

CIOs wear many hats. Sometimes they act like human resource specialists, managing as many as 500 people. They may supervise computer specialists, information technology workers, and customer support workers, and they are ultimately responsible for ensuring that everyone does his or her job. Success in this area is measured by how efficient and effective the company's information systems perform.

Since CIOs are often responsible for multimillion-dollar budgets, they also need sound money-management skills. Planning, budgeting, and tracking expenses are important aspects of their fiscal responsibilities.

## Get Started Now!

**Prepare yourself for a career as a CIO in the following ways.**

- Take advantage of opportunities to work on a team—teamwork is crucial for this job. Get out there and join a school club. Run for student council. Join a sports team.
- Strengthen your oral communication skills. Take speech classes and consider joining a school debate team.
- Learn as much about computers and computer languages as you can.

**explore your options**



### Search It!

CIC Chief Information Officers at [www.cic.uiuc.edu/groups/CIOs/index.shtml](http://www.cic.uiuc.edu/groups/CIOs/index.shtml) and National Association of State Chief Information Officers at [www.nascio.org](http://www.nascio.org)



### Read It!

CIO Magazine at [www.cio.com](http://www.cio.com) and CIO Insight at [www.cioinsight.com](http://www.cioinsight.com)



### Learn It!

- Minimum of a bachelor's degree in business administration, computer science, or liberal arts
- A master's degree in business administration (MBA) adds clout to a prospective CIO's resume



### Earn It!

Average annual earnings range from \$200,000 to \$300,000.  
(Source: Spencer Stuart Management Consultants)



### Find It!

See what employers want when they need a CIO by perusing the job listings at <http://jobs.cio.com>.

## Hire Yourself!

You've just been named CIO of your school's technology resources. Use computer software or poster board and markers to prepare two charts. The first one should feature an assessment of current uses of technology in your school. Make sure your list includes the names of all computer courses, a description of computer labs, and other types of technological resources available to students.

The second chart should include your ideas for future uses of technology in ways that would make learning more effective and enjoyable. For ideas, look at how some of the schools identified as innovative by the George Lucas Educational Foundation are using technology at [www.glef.org](http://www.glef.org) (click on the Technology Integration icon).

Of course, as their job title suggests, CIOs are also high-level technology experts. A key aspect of their job involves developing and managing corporate information systems, which may involve everything from internal telephone systems to international computer networks. They look for ways to improve network reliability and systems security. Modernizing systems can be a major responsibility: for instance, updating a computer network to connect to the Internet via high-speed modems. By staying informed of industry trends, CIOs maintain IT systems that are highly competitive. In general, CIOs are in charge of administrative information systems, operations and infrastructure, IT security, learning technologies, research computing, telecommunications, and videoconferencing.

Finally, CIOs are business executives. Although they may report to the CEO (chief executive officer) or the CFO (chief financial officer), they are business officers with the clout of the highest-ranking managers. Increasingly, CIOs help map out strategic business plans of a firm as part of the executive team. Like many executives, they often work long hours, evenings, and weekends. A good deal of travel may be required for attending and speaking at meetings and professional conferences.

Since CIOs deal with an extraordinary number of people and situations, they depend on highly developed interpersonal skills and a quick analytical mind to assess large amounts of information. The ability to effectively communicate complex technical information in ways that even the least tech-savvy person could understand is an extremely valuable skill for anyone with their hopes pinned on this type of highly prized leadership position. Other important skills include self-confidence, moti-



vation, decisiveness, and an interest in and ability to stay up with the latest information about technological advances.

When it comes to career status, CIOs work at the top of the technology game. In many ways, a company's ultimate success depends on how well they utilize technology. With so much at stake it should come as no surprise to learn that people don't land these prestigious positions straight out of college. CIOs work their way to this level through years of experience and proven leadership in business and technology.



#### **Search It!**

Animation World Network at  
[www.awn.com](http://www.awn.com)



#### **Read It!**

Animation World Magazine at  
<http://mag.awn.com>



#### **Learn It!**

- A bachelor's degree in computer animation, animation, art, computer studies, film, or graphic design
- Find information about more than 400 animation schools around the world at [www.awn.com](http://www.awn.com)



#### **Earn It!**

Average annual salary is \$48,000.  
(Source: Minnesota Workforce Center)



#### **Find It!**

Find all kinds of animation resources and employers at the Animation Industry Database at  
[www.aidb.com](http://www.aidb.com).

# find your computer animator future

## **computer animator**

If you've seen *Toy Story*, *Monsters, Inc.*, or *Shrek*, you've seen how computer animation can be used to build entire worlds inhabited by very lifelike characters. Even movies such as *The Matrix*, *Star Wars*, and *Mission Impossible*, which feature human actors, use computer animation techniques to create special effects and fantastic worlds. Sophisticated software has broadened the possibilities for animators, and in many ways, it has made the animation process a lot easier. Traditionally, an animator would sketch a series of images that when viewed sequentially would create the illusion of movement. Today, the computer lets the artist create those pictures without having to redraw elements. With a click of a mouse, an animator can redraw an entire character and slightly adjust its movement. Computer animation makes it much easier to create colors, textures, and complex movements. Plus, 3-D animation allows the artist to make more detailed, very realistic expressions and actions. In a live-action film, the impossible—perhaps

## **Get Started Now!**

**Have a love of drawing and technology? Then picture yourself in computer animation.**

- Build your basic art skills—you'll need them. Draw and paint. Join an art club. Take what art classes you can, and keep honing your fundamental artistic skills. In the long run, a distinctive style pays off, so work on your own cartoons and characters.
- Learn some simple computer graphics. See if your school or local college offers any multimedia courses. Popular animation software includes Maya, 3D Studio, Max, Tictatoon, Flash, Giff Animator, Ulead, and Adobe After Effects.
- Watch computer animated movies with a critical eye. Take note of complex graphic touches.

## Hire Yourself!

**C**omputer animation often begins with sketches and storyboards. A major appliance firm wants to hire you to computer animate its latest commercial. Draw a storyboard featuring at least 10 sketches showing how your commercial will sell the company's latest toaster, refrigerator, stove, or other appliance.

a giant snake eating a person—can come to life on-screen because of this technology.

Even a seemingly simple 2-D animated series like *South Park* depends on computer animation. Originally, the creators filmed the first show frame by frame using 5,000 paper cutouts. It took 70 days to film 22 minutes. Through computer animation, a complete new show can now be made every three weeks.

But the technology hasn't wiped out the hand-drawn techniques. All animators still sketch out their ideas and present them in a storyboard, which shows how the action of a film will progress. Professionals in this field need to master basic artist skills and principles to get their ideas down on paper. They understand color, texture, and perspective. Beyond art smarts, animators depend on storytelling skills, and that's why many are well-read and have taken literature courses.

This new, rapidly changing technology is finding applications in many different industries. In addition to films and television productions, computer animation is used in commercials and computer games. Websites employ various computer animation techniques as well, with Flash animation being the most simple and widespread. Because 3-D animation is a very effective way to illustrate and explain concepts, the technique is also being used in engineering, education, medicine, architecture, the military, and space exploration. Forensic animation recreates crime scenes and allows investigators to do things like trace the paths of bullets or recreate the details of a car accident.

Animators often work on a team with other animators and with other creative professionals. On a movie, an animator will collaborate with actors, musicians, writers, and sound effects experts, to name a few. The field needs artistic, independent thinkers.



#### Search It!

Precision Machined Products Association at [www.pmpa.org](http://www.pmpa.org)



#### Read It!

Machine Design magazine at [www.machinedesign.com](http://www.machinedesign.com)



#### Learn It!

- Specialized training in community and technical college
- The National Institute of Metalworking Skills ([www.nims-skills.org](http://nims-skills.org)) certification
- Apprenticeship and on-the-job training



#### Earn It!

Median annual salary for programmers is \$37,000 and for operators is \$32,000.

(Source: U.S. Department of Labor)



#### Find It!

Opportunities can be found at General Motors ([www.gm.com](http://www.gm.com)), Precision Machine Works, Inc. ([www.pmwinc.com](http://www.pmwinc.com)), and Precision Machine and Manufacturing ([www.precisiongrove.com](http://www.precisiongrove.com)).

# find computer control your operator future

## computer control operator

Traditionally, working in a trade meant making or fixing something with your hands—whether it's a wooden bookshelf, plumbing, or an electrical system. While trades still involve handiwork, technology has created a whole new breed of worker who uses computer numerically controlled (CNC) machines to cut and shape precision products, such as car doors, machine parts, and compressors. Work that had been done by hand with metal-machining tools such as lathes, multi-axis spindles, and milling machines can now be performed by a computer control module.

But computers can't operate by themselves, so those who would have worked as the machinists and operators now work the computers and leave more of the heavy labor to the automated machinery. Some call this field "knowledge-based machining."

## Get Started Now!

**Do you enjoy hands-on work and making things yourself? This could be the career for you! Here's how to get started.**

- Many high schools offer shop classes working with electricity and machine tools. Find out if your school or district offers them and consider enrolling.
- Look into high school courses in computers (including standard programming languages), electronics, mathematics, blueprint reading, metalworking, and drafting.
- Visit the Precision Metalforming Association's Educational Foundation website and check out all the resources available to students at [www.pmaef.org/student/index.htm](http://www.pmaef.org/student/index.htm).

## Hire Yourself!

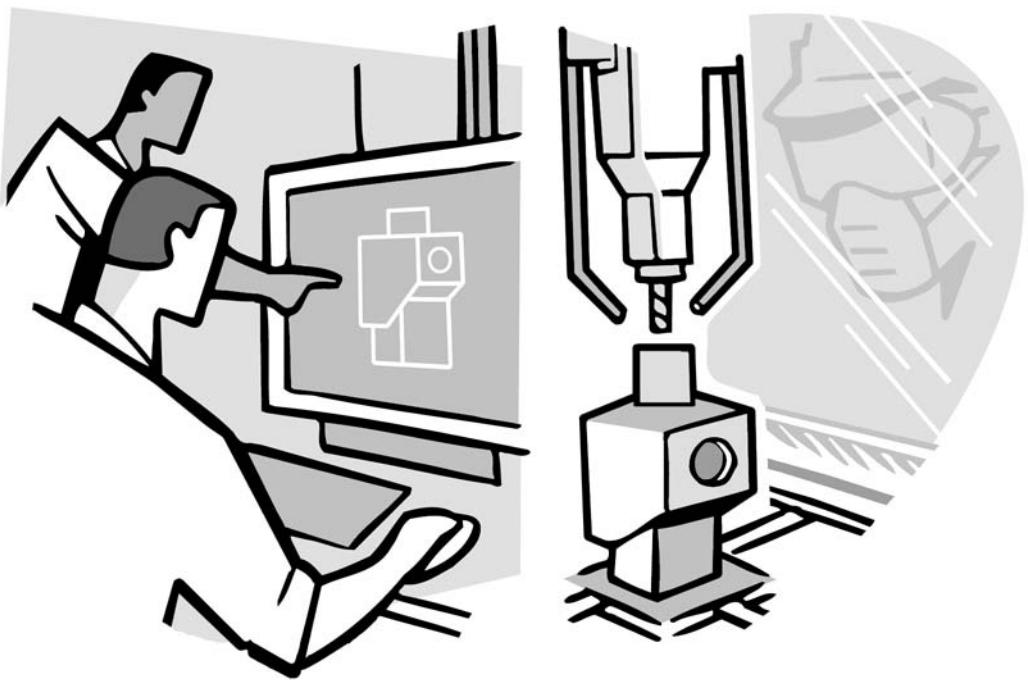
A recruiter from a local precision machine shop has come to your school looking for students who have a knack for putting together parts and making a final product. To find such young people, the company has decided to hold a model-building contest. Your assignment is to go to the local hobby shop or toy store and pick out a model with many parts that will demonstrate your ability to follow directions and construct a perfect final product. Keep track of how long it takes you and write down notes about some of the challenges you encountered along the way.

Preparing computerized equipment to make precision parts takes careful planning. First, computer control operators review three-dimensional computerized engineering diagrams, or blueprints, of the part. Next they calculate exactly how to cut the material, selecting the proper tool and the exact sequence for cutting. When the plan is determined, they write it as a set of instructions or a customized program that the computer can follow, using computer-aided design (CAD) and computer-aided manufacturing (CAM) techniques.

For example, computer control operators position metal stock on the CNC machine tool—such as a spindle, lathe, or milling machine—set the controls, and let the computer make the cuts. Heavier objects may be loaded with the assistance of other workers, a crane, or a forklift. During the machining process, computer control operators constantly monitor the readouts from the CNC control module, checking for problems.

Computer control operators often rely on their hearing to detect trouble—a dull cutting tool or excessive vibration makes a specific sound. Dull cutting tools are replaced and operation speeds are adjusted to correct erratic vibrations. Computer control operators also check that materials are properly lubricated and cooled, because the machining of metal products generates a lot of heat.

This career can be satisfying because workers see the direct results of their labor immediately in the product they make. For operators, the job demands that they be physically fit—they’re usually on their feet all day and often moving heavy materials and equipment. Because high-speed machine tools can be dangerous and loud, workers must wear protective gear, such as safety goggles to shield against flying bits of metal and earplugs to muffle machinery noise. Sometimes they handle hazardous coolants and lubricants, but with the right precautions this



can be done safely as well. Programming work tends to be less dangerous, and although done away from the equipment, programmers spend significant amounts of time in machine rooms making sure things are operating correctly.

Due to a shortage of qualified workers, employers are training newcomers in the basics of metalworking machines, safety, and blueprint reading. Beginners learn how to operate tools on the job as apprentices. Classroom instruction includes programming, blueprint reading, CAD software, safety, shop practices, math, and physics (for example, physics principles are applied at the cutting point to make precision cuts).

Aerospace, shipbuilding, medical equipment, automobile, and other industries all rely on the exact parts made by computer control programmers and operators. Even companies that make musical instruments rely on the know-how of these professionals. As the production of precision parts becomes increasingly automated, the demand for these workers is expected to rise dramatically in the next few years.

# find computer forensics your expert future

## computer forensics expert

Computer forensics experts are the Sherlock Holmeses of the IT world. When a computer crime is suspected, these cybersleuths pull out their magnifying glasses and analyze data to determine how things happened. They perform autopsies on dead laptops to uncover revealing clues. They present expert testimony in the courtroom that can convict the guilty party. Combining tech savvy with a knowledge of the criminal justice system, computer forensics is a new and exciting specialized occupation within the computer security field.

In general, computer forensics experts identify, extract, interpret, and document computer evidence. Typically, they copy an entire drive to have a backup of the original information before they get to work. They sift through active data (information one can readily access), archival data (details that are backed up and stored), and latent or ambient data (information that has been deleted or partially overwritten that typically requires specialized knowledge to get at). Deleted files and fragments of data can be found in the space allocated for existing files, known as slack space or unallocated space. This type of recovery of deleted files including e-mails has provided key evidence in the infamous Enron corporate fraud case.

## Get Started Now!

**Prepare for a career as a computer forensics expert by doing the following:**

- Build your knowledge of computer hardware and software. If you have a computer problem, solve it yourself because that's what computer forensics experts need to do.
- Search on-line for local law enforcement agencies and see if they have a computer forensics department. If so, you may want to inquire about interning for that department.

**explore your options**



### Search It!

The International Association of Computer Investigative Specialists at [www.cops.org](http://www.cops.org) and High Technology Crime Investigation Association at [www.htcia.org](http://www.htcia.org)



### Read It!

*Computer Forensics Online* at [www.shk-dplc.com/cfo](http://www.shk-dplc.com/cfo)



### Learn It!

A bachelor's degree in computer science or information science, or computer forensics.



### Earn It!

Average annual salary ranges from \$85,000 to \$120,000.  
(Source: Lenzner Group, as reported in *ComputerWorld*)



### Find It!

Check out Computer Forensics, Inc. ([www.forensics.com](http://www.forensics.com)), New Technologies Inc. ([www.forensics-intl.com](http://www.forensics-intl.com)), and Center for Computer Forensics ([www.computer-forensics.net](http://www.computer-forensics.net)).

## Hire Yourself!

The best technology in the world is no match for a well-trained investigative mind. See if you've got what it takes to be a cybersleuth by taking the U.S. Federal Bureau of Investigation's SA (Special Agent) Challenge. To participate, go on-line to <http://www.fbi.gov/kids/6th12th/sachallenge/sachallenge.htm>. Follow the instructions and prepare a one-page field report describing the results of your investigation.

In the public sector, the government and law enforcement personnel use computer forensics to investigate and prosecute crimes, such as networked-systems break-ins, the theft or alteration of data, the harassment of someone via e-mail, and identity theft. In the private sector, computer forensics is used to investigate electronic break-ins, embezzlement, improper use of computing resources, and theft of secrets. In the insurance industry, there have been cases where forensics uncovered e-mails that were sent outlining plans to fake back injuries and other ailments in order to receive insurance money.

A cyber detective may check the Internet and e-mail history of an individual suspected of committing a crime. Details as simple as the time and date of an e-mail can establish a crime timeline.

Lawyers today rely on computer testimony and evidence for all types of cases. In one case, a South Dakota minister was convicted of murdering his wife based on forensic information on his computer. Evidence was found that the preacher surfed the Internet researching painless but surefire killing methods and accessed detailed information on sleeping pills and lethal household agents.

Although it can be exciting uncovering life-or-death evidence, cybersleuthing can be intense and tedious. For months, cybersleuths can be alone searching through computer files, scanning thousands of hidden backup folders for certain key words. In the courtroom, they can be put on the stand and vigorously grilled by attorneys. To have cyber evidence validated in court, forensics experts have to be very careful and methodical about how they collect on-line evidence, dissect and analyze storage disks, keep detailed logs, and present testimony.

Sometimes computer forensics experts are employed to find information unrelated to crime—they may help a graduate student who has lost his master's thesis on a crashed laptop by repartitioning, reformatting, and loading in a different operating system.

Whether a forensics expert comes from a computer background or a background in law enforcement or the military, each one has persever-

ance and determination when it comes to solving problems. In time, they develop the ability to analyze systems to uncover evidence in such places as slack files, temporary files, hex files, log files, directories, e-mails, Word, Excel, and hardware such as read-only memory. They must stay current with the latest technology, and communication skills are essential, especially oral skills because they are often called to testify in court. Eventually, they learn state and federal statutes regarding the collection and preservation of evidentiary data.

As long as crime and computers continue in the world, there will be work for the forensics expert, especially as computer crimes become more sophisticated. *Computerworld* reported that most of the growth in this field has been in consulting firms that hire out cybersleuths on an as-needed basis.





#### **Search It!**

International Game Developers Association at [www.igda.org](http://www.igda.org)



#### **Read It!**

Game Developer magazine at [www.gdmag.com/homepage.htm](http://www.gdmag.com/homepage.htm)



#### **Learn It!**

- A bachelor's degree in multi-media or graphic design
- Specialized training at schools such as the Art Institute ([www.artinstitute.com](http://www.artinstitute.com))



#### **Earn It!**

Median annual salary for entry-level designers is \$25,000, while experienced designers make upwards of \$40,000.

(Source: University of Texas)



#### **Find It!**

Major employers are Nintendo ([www.nintendo.com](http://www.nintendo.com)), PlayStation ([www.playstation.com](http://www.playstation.com)), Xbox ([www.microsoft.com/xbox](http://www.microsoft.com/xbox)), and Hasbro ([www.hasbro.com](http://www.hasbro.com)).

# **find computer game your designer future**

## **computer game designer**

The computer game industry is rapidly expanding—from the home play stations and personal computers to video arcades and handheld gadgets. Computer games are being played on-line, in airplanes, and on cell phones. Yahoo! Games (<http://games.yahoo.com>) reports 8.5 million visitors each month. And players have an insatiable appetite for the new and challenging. That's why the industry is in hot pursuit of fresh ideas from those who know what makes a great game. Often, game manufacturers spend big bucks in pursuit of a hit. A major console and PC game like *Bloodrayne*, for example, cost \$6 million to \$7 million to complete.

Those who pursue this as a career find that it involves a combination of creativity and technical know-how. Designers rely on a vivid imagination to bring alive a world of adventure, fantasy role-playing, combat,

## **Get Started Now!**

**Training to become a top game designer demands that you get out there and play, play, play.**

- Become familiar with as many games as possible. If you haven't heard of *Myst*, *Quake*, *Doom*, or *Tomb Raider* (featuring Lara Croft), you have a lot of homework to do. On the days you can't get to a computer game, play a regular board game—you never know where inspiration may come from. Make notes of why a game is challenging or fun to play.
- Start a computer game club. Get together with friends on a regular basis to play new computer games and take time to evaluate each one in terms of difficulty and entertainment value.

## Hire Yourself!

**W**rite an outline for your own computer game. Think of a fun setting for the characters. Jot down the obstacles players will face and powers your characters will have. Explain how scoring might work and don't forget to establish the ultimate goal.

For ideas and inspiration explore the huge archive of computer games found at the Happy Puppy website ([www.happypuppy.com](http://www.happypuppy.com)). Also, be sure to take a look at computer game designer Tom Sloper's website. He provides a great outline for design document writing at [www.sloperama.com/advice/specs.html](http://www.sloperama.com/advice/specs.html).

or sports competition, for example. Making the vision a reality requires some very meticulous work—methodical step-by-step instructions must be written down. Everything a player might do, see, or hear is described in this design document. The document is the game's blueprint and features descriptions of a story line, characters, setting, rules, and mission (the object of the game). In many ways, it's like a movie script, except the plot can take many twists and turns depending on the player.

Sometimes it's hard for a single person to come up with narratives and story lines that will entertain players and test their reflexes, hand-eye coordination, logic, and ability to solve puzzles. That's why games are often developed through teamwork and hours of brainstorming and revisions. For many games, the team includes music composers, artists, and even actors.

The technical aspect of game design comes with the programming, which is the key to bringing a game to life. Programmers refer to the design document and translate the ideas into a functioning computer program. A familiarity with programming helps the designer understand the limitations and possibilities. Part of the programming process is the actual design of characters, objects, scenes, and sets. Game designers want to grab the attention of players so they often know some basics about animation, texture mapping, colorful 3-D graphics, and the integration of text, audio, and video.

To gain employment, designers typically build a portfolio to show off concepts and creative skills. They network with industry professionals at trade shows such as E3 Expo ([www.e3expo.com](http://www.e3expo.com)).



#### Search It!

Association for Computing Machinery at [www.acm.org](http://www.acm.org) and ICCP Computer Society at [www.iccp.org](http://www.iccp.org)



#### Read It!

Computerworld at [www.computerworld.com](http://www.computerworld.com)



#### Learn It!

- On-the-job training
- Certification from community college or technical school
- Specialized training through computer and software companies such as Microsoft or Dell
- A bachelor's degree in a computer-related field can be helpful



#### Earn It!

Median annual salary is \$27,600.  
(Source: U.S. Department of Labor)



#### Find It!

Companies that employ computer operators include RS Information Systems ([www.rsis.com](http://www.rsis.com)), Raytheon ([www.raytheon.com](http://www.raytheon.com)), and Transaction Network Services ([www.tnsi.com](http://www.tnsi.com)).

# find your computer operator future

## computer operator

Computer operators follow detailed operating instructions prepared by computer programmers to set the controls of the equipment they are using, monitor progress on specific tasks and projects, and troubleshoot problems. Sometimes specific jobs require that operators load equipment with tapes, disks, paper, or other materials. In the case of powerful mainframe systems, computer operators may be needed to monitor control consoles and keep things running 24 hours a day, seven days a week—a situation that requires operators to work a variety of eight-hour shifts including traditional nine-to-five schedules as well as those requiring evening and overnight schedules.

If a long job is running, the operator checks the monitor and responds to operating messages. When an error message appears, the operator must solve the problem or end the program. Malfunctions and other events get written down in a logbook. In addition, computer operators may help programmers and systems analysts test and debug new programs.

More and more computer operators perform their work on personal computers that can be connected through networks and accommodate multiple users. Much of this type of work is performed in comfortable office settings. Organizations with high-volume data-processing needs

## Get Started Now!

**To become a computer operator, start now with some preparation:**

- Know your way around your basic personal computer. Learn the standard Microsoft Office and Windows software.
- Spend as much spare time as possible in the school computer lab. If you can, volunteer to work on computer-related projects that will build your skills.

## Hire Yourself!

Computer operators are often in charge of making systems more efficient. Suppose you are employed by your state's department of education. They've asked you to determine strategies to help high school students complete homework assignments more efficiently using computers. Think about this, discuss it with friends, and create a chart or poster that describes your top 10 suggestions.

such as manufacturing companies, business service firms, financial institutions, and government agencies commonly employ computer operators.

Besides basic and sometimes very specific types of computer skills, computer operations also require keen analytical and problem-solving skills. The ability to work well with others, to communicate with people with varying degrees of technical knowledge, and the self-discipline to work effectively with little or no direct supervision are other skills that computer operators share.

As technology becomes more sophisticated, tasks traditionally performed by computer operators will change. Advances in robotics and automation will create new ways to increase productivity. These types of advances will eventually tackle time-consuming and tedious functions such as scheduling, downloading programs, rerouting messages, and running reports. While these advances are likely to reduce the number of computer operators overall, they are also likely to demand more sophisticated computer skills from the workers who remain. In order to stay a step ahead of this technological competition, computer operators need to cultivate skill working with a variety of operating systems, keep their formal computer-related training current, and work toward positions of greater responsibility within their companies. Flexibility and adaptability will be keys to future success in this field.

This occupation often provides a good starting point for a career in IT. Many use it as a stepping stone to opportunities in areas such as management, network operations, or programming.





#### Search It!

Institute for Certification of Computer Professionals at [www.iccp.org](http://www.iccp.org) and Association of Information Technology Professionals at [www.aitp.org](http://www.aitp.org)



#### Read It!

Dr. Dobb's Journal at [www.ddj.com](http://www.ddj.com)



#### Learn It!

- Bachelor's degree in computer science, mathematics, or information systems
- Fluency in programming languages such as C and Java



#### Earn It!

Average annual starting salary is \$40,800.

(Source: National Association of Colleges and Employers)



#### Find It!

Investigate companies such as Microsoft ([www.microsoft.com](http://www.microsoft.com)), Sun Microsystems ([www.sun.com](http://www.sun.com)), and Symantec ([www.symantec.com](http://www.symantec.com)).

# find your computer programmer future

## computer programmer

In the information technology world, so many different job descriptions overlap that it gets confusing as to who does what. There are computer systems analysts, software engineers, computer scientists, and computer support specialists, to name a few. Although these careers can be distinct, they almost always share a common foundation—a knowledge of computer programming.

Programs are the detailed instructions that computers read to do what they're supposed to do. From flight simulators to video games to search engines like Google, there's a computer program working behind the scenes. You've probably already had some experience with computer programs (also called software)—for example, you might have saved a program for your printer off of a CD-ROM so you can print from your personal computer.

Programmers write and test the software. Creating elaborate coding instructions for computers requires programmers to be logical and detail-oriented. It also means learning a foreign language. You have to be flu-

## Get Started Now!

**Here are some ways to pump up your logic skills and develop programming smarts.**

- Challenge yourself and hone your analytical thinking skills by taking as many high-level math classes as your schedule allows.
- Start to learn a programming language. Many high schools and local community colleges offer beginner courses.
- Volunteer to help out in your school's computer lab to observe firsthand how computer users interact with various computer programs.

## Hire Yourself!

You've been hired by a software company to write a program to automate a lawnmower to mow the lawn. Your first step is to write down all the data that the mower will need to know get the job done right. This might include the size of the lawn, when to mow, and the speed of the mower. Prepare a document with a solution you could submit to the company.

ent in a computer language if you want to tell a computer what to do. Common languages are C, C++, Visual Basic, and Java. Programmers usually know more than one language, and since many languages are similar, they can often learn new programming languages easily.

Simple programs can be written in a few hours, while programs that use complex mathematical formulas may require more than a year to finish. Basically, it's a job for puzzle-solvers. You must analyze and define the problem (what is your program trying to do?) and then design the solution (come up with a logical sequence of steps that will solve the problem—also known as an algorithm). You must figure out how the input will be obtained and how the output will be displayed. You translate your algorithm into code or language, and then when you're done, you run a test with representative data. That's the way to find problems ("bugs").

As with a lot of puzzle solving, the job takes patience. Answers don't always come easily. Along the way, programmers must be detailed and organized, documenting all their thinking and analysis on paper. Many programmers update, repair, or modify existing programs. They make changes to a section of code, called a *routine*. Computer-aided software engineering (CASE) tools make a programmer's life easier because they automatically generate whole sections of code for routine steps.

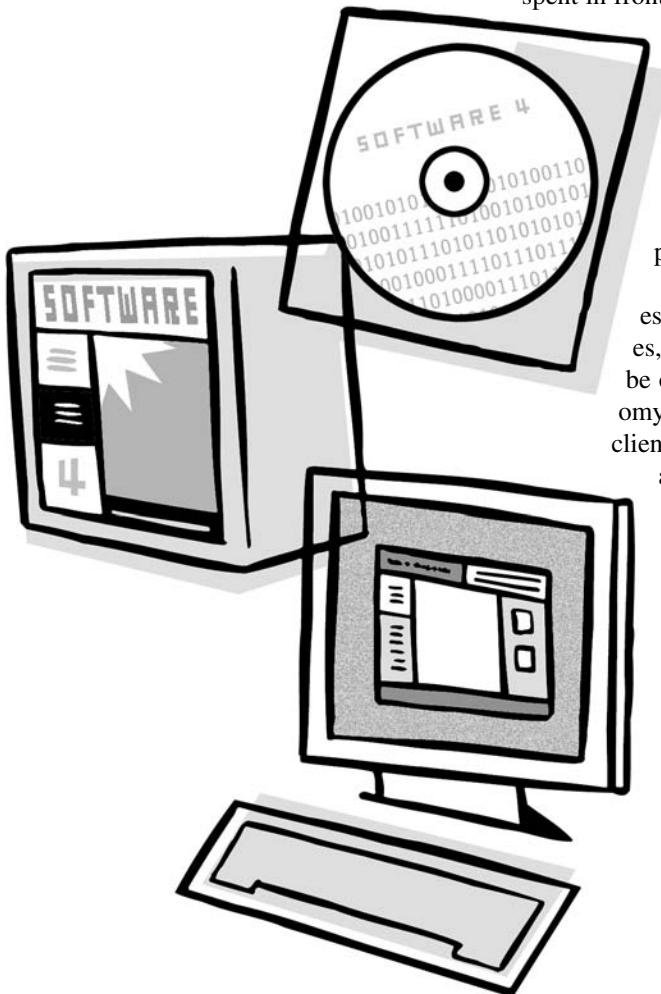
Programmers fall under two broad categories: applications programmers and systems programmers. Applications programmers write software to handle a specific job, such as a program to track inventory within an organization. They may work on products as diverse as games and educational software, desktop publishing programs, and financial planning and spreadsheet applications.

On the other hand, systems programmers maintain and control the software for entire operating systems, networked systems, and database systems. Working with the network, workstations, and central processing units of a computer system, these professionals create and modify instructions for the handling of various jobs and communications with

peripheral equipment, such as terminals, printers, and disk drives. An example of a successful programmer is Linus Torvald, who in his early 20s created a program for an operating system that works on home Macintoshes and PCs called Linux, and he distributed it for free.

Programmers generally work in comfortable offices. But all that time spent in front of a computer can lead to back discomfort, eye-strain, and wrist pain. And the job can be stressful, as programmers often must meet tight deadlines. So they must learn to take care of themselves by taking breaks and getting exercise, despite their intense work. Sometimes programmers work alone, or several programmers may work together as a team under a senior programmer.

Job opportunities are expected to be plentiful, especially in computer and data processing services, which the Bureau of Labor Statistics predicts to be one of the fastest growing industries in the economy. Other hot areas of demand are anticipated for client/server programming, multimedia technology, and graphical user interface (GUI) design.



# find computer repair your technician future

## computer repair technician

We live in a world filled with inexpensive electronic devices—cameras, CD players, DVDs, and more. When they break, it's often less expensive to buy new ones than have the old ones fixed. But computers and their components are a different story. Because they're much more expensive than most electronic gizmos, computers are not simply tossed on the garbage heap when they malfunction. Computer repair technicians can often fix the problems for a lot less than it would cost to buy new equipment.

Also known as data processing equipment repairers, these technicians work on all sorts of computer equipment—mainframes, servers, and personal computers, as well as printers and disk drives. In general,

### Get Started Now!

**The path to becoming a computer repair technician begins with a basic understanding of electronics and the components inside a computer.**

- Take all the electronics courses you can. Some schools offer electives such as electric shop, or there might be an after-school club. Check with a local community college as well.
- Hobby shops and toy stores usually sell kits to build basic electronic devices at home. Finishing these projects will give some basic knowledge of electronics and some beginning hands-on experience.
- If you're advanced, ambitious, and have a lot of time to spare, you can attempt to build your own computer. There are a few websites on how to do it, such as [www.buildyourowncomputer.net](http://www.buildyourowncomputer.net) and [www.mysuperpc.com](http://www.mysuperpc.com).



#### Search It!

Computing Technology Industry Association at [www.comptia.org](http://www.comptia.org) and International Society of Certified Electronics Technicians at [www.iscet.org](http://www.iscet.org)



#### Read It!

MaximumPC at [www.maximumpc.com](http://www.maximumpc.com) and Dux Computer Digest at [www.duxcw.com](http://www.duxcw.com)



#### Learn It!

- An associate's degree in electronics
- Certification from a reputable professional association (see Search It! above)



#### Earn It!

Median annual salary is \$31,400.  
(Source: U.S. Department of Labor)



#### Find It!

For some interesting opportunities, check out Cascade Asset Management ([www.cascadeassets.com](http://www.cascadeassets.com)), SBC Communications ([www.sbc.com](http://www.sbc.com)), Hewlett-Packard ([www.hp.com](http://www.hp.com)), and Ford Motor Company ([www.ford.com](http://www.ford.com)).

## Hire Yourself!

Your school wants to start teaching a course on computer basics, and the principal knows you're fairly smart and may be able to help develop the materials. Your first assignment is to draw a map of the basic components inside a computer.

Use resources such as those you can find at the How Stuff Works website at <http://computer.howstuffworks.com> to look "under the hood" of a personal computer. Draw a simple diagram identifying as many components as you can: the floppy and CD drives, the printer serial port, the telephone line ports, memory chips, processor, battery for the clock, motherboard and other boards, modem, floppy drive controller, SCSI card, and so on.

there are two types of repairers—the field technicians who travel to a customer's workplace to make repairs, and the bench technicians who work in repair shops located in stores, factories, or service centers.

No matter which type of technician, they all perform the work of a computer surgeon. They diagnose what's gone wrong with a computer based on their examination and information from the computer user, and then they open up the computer to make repairs. Repairs often mean replacing defective components rather than actually repairing, because parts are sometimes inexpensive. Components commonly replaced by computer repairers include video cards, which transmit signals from the computer to the monitor; hard drives, which store data; and network cards, which allow communication over the network. (If it is more cost effective to repair the component, it's usually brought into the shop of the bench technician to be fixed.)

In addition to repairs, technicians install computers and related equipment and perform general maintenance. Many repairs simply involve cleaning equipment.

Technicians rely on their knowledge of electronics and a variety of tools to run diagnostic tests and make repairs. Common repair tools include multimeters that measure voltage, current, resistance, and other electrical properties; signal generators that provide test signals; and oscilloscopes that monitor equipment signals. They may also run software programs that can help identify problems. To repair or adjust equipment, technicians often pull out the hand tools—pliers, screwdrivers, soldering irons, and wrenches.

Computer equipment can be very sensitive, so repairers work in clean, air-conditioned, and well-ventilated offices with plenty of light to

make those exacting fixes. It's not a very dangerous job, but any job involving electricity requires extra caution. Because computers are critical for many organizations, repairers often work odd hours, including evenings, weekends, and holidays.

If you like to tinker or build models and are someone who likes to roll up his or her sleeves and see how things work, this may be a perfect career match. Plus, technicians are in high demand as employers depend more and more on their computer systems, yet report a lack of qualified repairers, according to the Bureau of Labor Statistics. Data processing services and companies that sell professional and commercial computer equipment employ the most repair technicians, and about one in seven are self-employed. As they gain experience, repairers can move into other positions in engineering, design, customer service, or sales.





#### **Search It!**

National Association of Specialist Computer Retailers at [www.nascr.net](http://www.nascr.net).  
**nascr.net** and the Association for Computing Machinery at [www.acm.org](http://www.acm.org)



#### **Read It!**

Stores magazine at  
[www.stores.org](http://www.stores.org)



#### **Learn It!**

- On-the-job training
- Trade school certification



#### **Earn It!**

Average annual starting salary is \$16,000, but can go much higher with commissions. Average annual salary for computer sales managers is \$75,000.

(Source: Bureau of Labor Statistics and Monster.com)



#### **Find It!**

Salespeople work directly for manufacturers such as Dell ([www.dell.com](http://www.dell.com)), Compaq ([www.compaq.com](http://www.compaq.com)), Acer ([www.acer.com](http://www.acer.com)), and for retail companies like CompUSA ([www.compusa.com](http://www.compusa.com)) and Best Buy ([www.bestbuy.com](http://www.bestbuy.com)).

# find computer sales representative your future

## **computer sales representative**

A lot of people get their first real work experience selling something. This even includes celebrities like Johnny Depp who sold pens and Madonna who sold doughnuts. Sales can be a rewarding and lucrative career. And sales is one of the fastest growing occupations in the country, according to the U.S. Bureau of Labor Statistics.

As computer technology advances and more people rely on computers for work and in their personal lives, computers and related products will continue to be some of the biggest selling items in the world.

The key to any sales job is knowing your product and being a good teacher. Someone selling personal computers, for example, will need to

### **Get Started Now!**

**If you've ever had success selling lemonade, cookies, comic books, your old junk, or anything at all, you might consider a career in sales. Here's how to prepare:**

- Computer sales people need basic computer knowledge. In addition to knowing how to use a PC and set it up, it pays to have some basic training in programming and computer languages.
- Take any opportunity to get involved with sales, whether it be selling raffle tickets for a school benefit or Girl Scout cookies, or working part time at a local store.
- Tons of books and articles have been written about how to be a successful salesperson. Check on-line and at the library for these materials—you can learn some valuable tips on what motivates people.

## Hire Yourself!

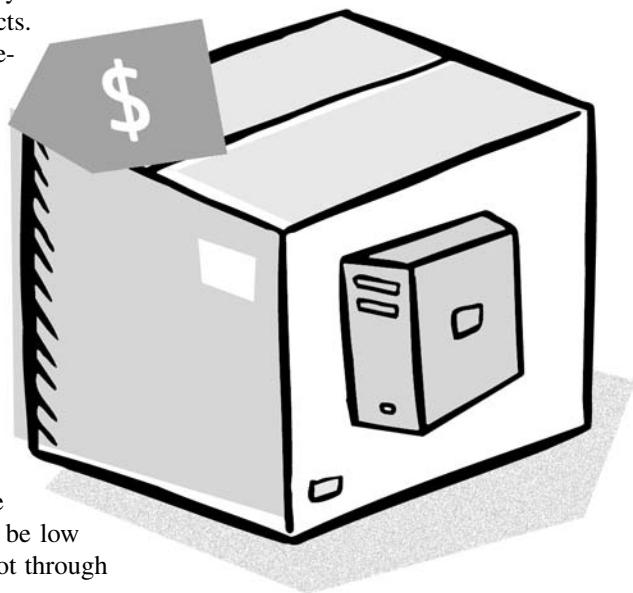
The local homeless shelter has come to you to help raise money for the shelter. You have to come up with an event or sale that will bring in the big bucks. Your assignment is to think of the event or sale (e.g., car wash, book sale, raffle, bake sale). Write down how you will organize it, advertise it, when the optimal times will be to hold the event, who will work the event, and how much items will cost. Also, think of incentives that will encourage people to buy. People love deals or the idea that they're getting something for free. For example, if you hold a car wash you might offer customers a free cup of coffee while they wait. Present your plan in a PowerPoint presentation.

explain all the functions of the PC and demonstrate how to use it. The more a customer understands a product, the more likely he or she is to buy it. Because computer equipment can be fairly complex, many of these sales representatives need special training to sell the software and hardware. Major computer manufacturers have very specific training programs to teach representatives how to sell their products.

Sales representatives have to be good communicators who enjoy meeting new people. They have to listen closely to customer needs so they can supply them with the right products.

Tact and patience are essential because sometimes people can be difficult to deal with. Sales representatives also handle the financial details of a transaction. In the retail world, they receive funds and give out change and receipts, often operating a cash register. Other responsibilities include taking care of returns and exchanges, stocking shelves, taking inventory, and preparing displays. Evenings and weekends can be busiest because that's when most people have the time to shop.

Although many salespeople work directly with the general public, many sell products to other businesses. Sometimes transactions don't even occur face-to-face, but take place over the phone or even on-line. Base pay can be low for sales representatives, but they can earn a lot through



commissions or financial rewards based on how much they sell. Some companies use bonuses and profit sharing as extra incentives to inspire their salespeople to sell more.

Marketing is another occupational option for the natural born salesperson. The marketing department at a firm figures out the overall strategy for selling, promoting, advertising, and distributing a product. Sales and marketing people work very closely together to sell as much product as possible. Both careers give a lot of consideration to human psychology—what makes a customer want to buy something? If you think you have persuasive powers and understand what motivates people to make a purchase, this could be the perfect career for you.

# find computer science your teacher future

## computer science teacher

If you're really passionate about computers, you may want to share your enthusiasm and turn others on to the challenges and rewards of technology. Colleges and high schools are looking for computer buffs who can teach students the basics and beyond. The fact is that at many high schools, computer teachers have minimal formal preparation in computer science and have been educated in other fields. Computer science is simultaneously a mathematical, scientific, and engineering discipline, and high schools often incorporate their computing lessons as part of the math, science, or technology courses.

There is no one standardized approach to teaching high school computer science. Students may learn a simple word-processing application or an introduction to programming in a language such as LOGO, BASIC,

## Get Started Now!

**Learn as much as you can about computers and related math and you may become a computer science teacher.**

- Take the computer science courses offered by your school and keep a close eye on the teacher. Watch how he or she does the job and consider whether you could see yourself in that position.
- Volunteer at the school computer lab and encourage other students to come to you with their questions.
- ACM offers an entire high school computer science curriculum on its website at [www.acm.org/education/hscur/index.html#toc](http://www.acm.org/education/hscur/index.html#toc). It's worth checking out if you're serious about teaching computers.



### Search It!

Association for Computing Machinery's (ACM) K-12 Task Force at [www.acm.org/education/k12/about.html](http://www.acm.org/education/k12/about.html) and Computer Science Teaching Center at [www.cstc.org](http://www.cstc.org)



### Read It!

*LessonPlanz.com* (Computers & Technology) at [www.lessonplanz.com](http://www.lessonplanz.com) and *Teaching Computers to Children* at [www.suite101.com/welcome.cfm/teaching\\_computers](http://www.suite101.com/welcome.cfm/teaching_computers)



### Learn It!

- At least a bachelor's degree in education, technology education, or computer science
- State teaching certification or license



### Earn It!

Median annual salary ranges between \$33,590 and \$53,720. (Source: U.S. Department of Labor)



### Find It!

Check with schools near you about employment opportunities.

## Hire Yourself!

**A** lot of students have a view that computer classes are boring. Your high school is starting a new computer science class, and they come to you to tap your creative mind for ways to make the course exciting. Come up with five strategies that you think will make computer science the class everyone wants to take. Use a separate piece of paper to describe and/or illustrate each idea.

or Pascal. A movement is out there, however, to train better computer science teachers, and a few organizations have been developing model curriculums. The Association for Computing Machinery (ACM) has created a curriculum for high school computer teachers, and the College Board now offers advanced placement (AP) computer science exams. Now that the College Board is testing the subject, some teachers build their lessons around the AP curriculum, focusing on object-oriented programming with an emphasis on problem-solving and algorithm development. ACM's lessons include the basics of algorithms, programming languages, operating systems, user support, and computer architecture.

You need a firm grasp on those topics to teach but you also have to prepare yourself to be an educator. Teachers need to be comfortable lecturing in front of a group, using audiovisual aids and other materials to enhance presentations. Maintaining discipline can be a real challenge. Teachers spend hours outside of the classroom preparing lessons, exercises, and homework assignments, in addition to figuring out course objectives and making sure that their lesson plans meet state and school requirements. They also grade tests and homework and communicate with parents about their child's performance. They meet with students to deal with their problems, and they meet with parents in person occasionally to discuss student progress.

Beyond class-related work, teachers spend time in faculty meetings, educational conferences, and teacher training workshops. They typically lend a hand with school extracurricular activities and student organizations. Computer teachers may also monitor computer labs, service computing equipment, and provide computer expertise for others in the school.

According to the Bureau of Labor Statistics, opportunities for all teachers are expected to grow over the next decade, and since computers are becoming part of more and more occupations, computer teachers especially should be in demand.

# find computer security your specialist future

## computer security specialist

Security is probably one of the biggest problems that we face in the world, and one vulnerable target for individuals, businesses, and the government has been computers. Unfortunately, some computer whizzes use their know-how to gain unauthorized access into computer systems and steal or corrupt valuable information. These people are often referred to as "hackers" or "crackers." Sometimes they are outsiders who crack into a system through an Internet connection; sometimes they are insiders who work at an organization and infiltrate its system. The work of the computer security specialist is to set up and maintain systems that will detect and prevent these cyber crimes.

According to the 2003 Computer Crime and Security Survey of 530 businesses, financial losses because of computer crimes topped \$200

### Get Started Now!

**Ready to find a secure path to a career as a computer security specialist? Take these first steps:**

- Security pros know programming basics, so take courses in the fundamental programming languages.
- Eventually you'll have to know a lot about the major server and operating systems, so it pays to read up on those products manufactured by Microsoft, Cisco, and Linux. Become a pro at setting up operating systems at home, then try volunteering to set up a network somewhere such as a local charitable organization.
- Take on all problems you encounter with an operating system. Sharp trouble-shooting skills are vital for the security specialist.

**explore your options**



#### Search It!

Computer Security Institute at  
[www.gocsi.com](http://www.gocsi.com)



#### Read It!

Internet Security Newsletter at  
[www.securecomputing.com](http://www.securecomputing.com)  
and Netsurfer Focus at [www.netsurf.com](http://www.netsurf.com)



#### Learn It!

A bachelor's degree is recommended in electrical engineering, information science, information systems, computer science, physics, mathematics, or a related science or technical field.



#### Earn It!

Median annual salary is \$88,000.  
(Source: [www.datamasters.com/survey.html](http://www.datamasters.com/survey.html))



#### Find It!

Check out some firms that deal exclusively with computer security issues such as Online Security ([www.onlinesecurity.com](http://www.onlinesecurity.com)), Network Associates ([www.nai.com](http://www.nai.com)), and Symantec ([www.symantec.com](http://www.symantec.com)).

## Hire Yourself!

**G**o on-line to the FBI's National Infrastructure Protection Center at [www.nipc.gov](http://www.nipc.gov) and review the information you find there. Pay special attention to the resources found when you click on the Related Sites icon at [www.nipc.gov](http://www.nipc.gov). Make a list of five current security issues or situations involving technology. Next to each item on your list include a description of the problem as well as your suggestions for solving each problem.

million. That rampant computer crime is why companies that sell products on-line go to great lengths to set up systems that allow customers to securely transmit credit card numbers and other personal information so it cannot be viewed by outsiders. The federal government is also on the lookout for cyber criminals. The FBI has established the National Infrastructure Protection Center (NIPC) whose mission is to prevent and respond to cyber attacks on the nation's infrastructures—telecommunications, energy, government operations, etc.

Although they often want to steal information, hackers sometimes just want to wreak havoc. Some will transmit a "worm" or "virus" program that replicates itself over a computer network and performs malicious acts, such as using up a computer's resources or shutting it down. You may have heard of some of the famous viruses in the news, such as Blaster and SoBig.

One of the jobs of security specialists is to stop these viruses, and to do so, they install antivirus software. One of the most well-known antivirus protection packages is Norton Antivirus. Antivirus software is often part of a bigger system that security professionals establish to block or limit access to network information. These systems are typically called firewalls, and they prevent unauthorized users, both on the Internet and in the office, from accessing a private network. If someone does gain access, an Intrusion Detection System (IDS) is usually in place to detect it. To allow access to authorized network users, the security professional establishes a password system.

Once a security system is operating, specialists monitor how it is functioning, evaluate performance, and make upgrades as needed. They maintain log-on accounts and passwords for network users and identify and respond to possible security violations. Security professionals rely on interpersonal skills, as they typically work with a team of other computer experts who maintain and operate a system. These specialists may also work directly with a software manufacturer to help create programs

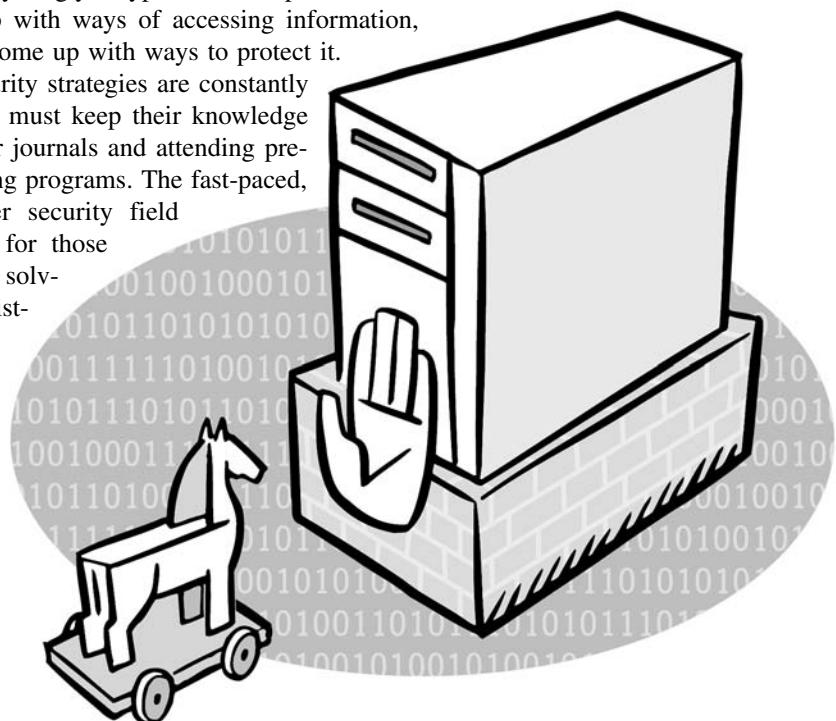
that cannot be hacked into. Microsoft, for instance, had discovered critical flaws in its operating system software that had to be fixed. Microsoft also offers a security guide to help systems administrators secure the operating system.

Some security professionals specialize in cryptography—the art of protecting information by transforming it, or encrypting it, into an unreadable format, called cipher text. Only those who possess the key can decode the message. Cryptography is used to protect e-mail messages, credit card information, and corporate data. (A popular free encryption package is called Pretty Good Privacy.)

Another highly specialized, emerging area of security is biometrics, which involves the “scanning” of different parts of the body, such as a fingerprint, an eye, or a voice, to create a password or ID. The information is usually placed through an algorithm that turns it into a code that is stored in a database. Iris scans are now even being used at ATMs in England to allow customers access to their accounts.

Cybersnoopers are getting more and more sophisticated. Some now use spyware software that covertly gathers information from a user’s Internet connection. A surveillance method called Carnivore captures all e-mail messages to and from an account. Programs known as key loggers and Trojan Horses can track everything you type into a computer.

As fast as hackers come up with ways of accessing information, security professionals have to come up with ways to protect it. Since new technology and security strategies are constantly being introduced, professionals must keep their knowledge up to date by reading computer journals and attending presentations, seminars, and training programs. The fast-paced, continually changing computer security field offers plenty of opportunities for those who enjoy new challenges and solving problems through the persistent use of logic.





#### **Search It!**

Association of Computer Support Specialists at [www.acss.org](http://www.acss.org) and Association of Support Professionals at [www.asponline.com](http://www.asponline.com)



#### **Read It!**

Call Center magazine at [www.callcentermagazine.com](http://www.callcentermagazine.com)



#### **Learn It!**

- Two-year degree certification for entry-level position
- Bachelor's degree in computer-related major for advanced position



#### **Earn It!**

Median annual salary is \$37,120.  
(Source: U.S. Department of Labor)



#### **Find It!**

Computer support specialists work for companies such as Motorola Computer Group ([www.motorola.com/computers](http://www.motorola.com/computers)). Interesting job-related sites worth a visit are [www.geeksbyminute.com](http://www.geeksbyminute.com) and [www.dice.com](http://www.dice.com).

# **find computer support your specialist future**

## **computer support specialist**

The computer crashes just seconds before your term paper is finished, and of course you haven't saved it in hours. The printer is jammed. You think you've erased an important client list but want to do everything to find it. Who do you turn to? It's the computer support specialist to the rescue. They may not have a high-profile position, but these specialists are heroes to those suddenly facing a computer crisis. Their job is to be thoroughly familiar with equipment, software, or a system so they can solve problems posed by computer users.

This job category breaks into two camps: technical support specialists and help-desk technicians. Technical support specialists are com-

## **Get Started Now!**

**Like computers and like to help others? Here are steps you can take now to prepare for this career.**

- Support specialists are well versed in computer basics. Build a foundation of computer knowledge by taking some fundamental courses in programming.
- This career may depend on communication skills more than any other computer occupation since support specialists field questions all day long from a variety of people. Tutoring can really help build the type of communication skills needed for this job. Look for opportunities to teach others in order to gain experience working one-on-one and solving people's problems. Jump at any chance to assist in a school computer lab.
- So many positions in this field require telephone work. Any opportunities doing telemarketing or phone surveys will give the type of experience needed for this job.

## Hire Yourself!

Create the beginnings of a computer homework helpdesk. Ask several classmates to describe the kinds of problems they typically encounter when using computers. Create a list of the top 10 problems; then write a tip sheet with step-by-step instructions for solving each problem. Compile each tip sheet in a notebook or helpdesk folder.

puter trouble-shooters working in-house at a company. They help coworkers with computer setbacks and install, modify, clean, and repair computer hardware and software. Because they are usually knowledgeable about a company's system, these specialists often wind up writing instruction manuals and teaching employees how to use equipment. They also oversee and evaluate general performance of a system and make recommendations for upgrades.

Help-desk technicians solve customer problems on the telephone or by e-mail. Typically, they help the home PC user who is in crisis mode with installation or use problems. Unlike the tech support specialists, these technicians cannot address the problem in person, so they need extra strong communication skills in order to understand a customer's problem and patiently walk him or her through corrective measures. Since they are constantly hearing feedback from users, technicians can give valuable insight on product shortcomings and ideas for product improvement.

Those who thrive in this occupation can think fast on their feet—they need to analyze problems quickly and offer incisive solutions. Their verbal communication skills are well honed to listen carefully and pose questions that help pinpoint problems. These specialists need effective written communication skills as well since they often write directions, training brochures, reports, and manuals.

Professionals in this area mostly work for computer and data processing services as well as banks, government agencies, insurance companies, educational institutions, personnel supply services, computer manufacturers, and retail vendors of computers.

As technology continues to develop and become more complex, the U.S. Bureau of Labor expects expanding job opportunities in this market. Statistics predict employment for these specialists will grow faster than the average for all occupations through 2012. As long as new products are manufactured and as long as people continue to use technology, support specialists will be in big demand to help battle the glitches, crashes, and other hazards of computer use.



#### **Search It!**

Association for Computing Machinery at [www.acm.org](http://www.acm.org)



#### **Read It!**

The Database Administrator Newsletter at [www.tdan.com](http://www.tdan.com)



#### **Learn It!**

- A bachelor's degree in computer science, information science, or management information systems (MIS)
- Specialized training in specific database programs such as Microsoft's SQL Server



#### **Earn It!**

Median annual salary is \$51,990.  
(Source: U.S. Department of Labor)



#### **Find It!**

For a major publisher, check the Hearst Corporation ([www.hearstcorp.com](http://www.hearstcorp.com)); for an insurance company, visit GEICO ([www.geico.com](http://www.geico.com)); and for a nonprofit organization, visit the Sierra Club ([www.sierraclub.org](http://www.sierraclub.org)).

# find database administrator your future

## **database administrator**

“Too much information driving me insane” are lyrics that the rock musician Sting sang when he was with the group The Police. Those words are so appropriate today, as we seem to be living in a time of an information explosion. To keep the information organized and properly stored, businesses and other groups turn to database administrators for some sanity.

Database administrators (sometimes called DBAs) are responsible for setting up databases and assuring that they are accurate, complete, and up-to-date. To make sure data cannot be lost, they arrange for it to be backed up or stored on other drives in case a computer crashes. DBAs determine who the users are and how the database can best serve them. They continually monitor how the database is being used so they can evaluate and make improvements.

To really understand what a DBA does, you have to back up a little and know what a database is. A database is a collection of information organized so a computer program can quickly find desired data. It's like an electronic filing system. Databases are generally organized by either a field (a single piece of information), a record (a complete set of fields),

## **Get Started Now!**

**Want to feel the rush of controlling mountains of information? Get your career in database administration started by trying the following:**

- Build a foundation of knowledge in programming and mathematics.
- Consider an internship or co-op in the field of database administration to gain the real-life experience that companies crave.

## Hire Yourself!

Pick a favorite sports team or music group. List three types of information that fans typically want to know about them. For instance, sports fans might want to know about things like the team line-up, the playing schedule, and each player's stats. Music fans want to know concert schedules, a list of the group's best songs, and the group's biographical information.

Use your favorite Internet browser to seek out this type of information about your favorite team or group. Then use a computer software program that you are comfortable with like Word or Excel to create a table, chart, or other organizational structure to keep track of this information. Print out the results.

or a file (a collection of records). You can picture a telephone book as a file containing records of names, addresses, and phone numbers (the three fields in each record).

To administer the database, the professional needs to know very specific database programming. A standard language for getting information from and updating a database is SQL (structured query language). The language lets you select, insert, update, and find out the location of data. DBAs also need to be familiar with systems or “platforms” that the database runs on. One popular database management system (DBMS) is a relational database management system (RDBMS). This type stores data in related tables and allows a database to be viewed in many different ways. Usually DBAs want to make sure that the system is accessible and providing data 24 hours a day, so they are constantly monitoring the hard drives and server, checking the error log for any possible mistakes.

One of the biggest issues in data management is security. With the volume of sensitive data growing rapidly, data security has become one of the most important aspects of the job. Security not only means keeping the information safe and intact, but preventing access by unauthorized users.

Although it may not seem like it at first, database administration is very much a “people” job. Administrators are often teachers who must effectively communicate with staff to ensure that information is being captured correctly and used appropriately. To make changes in a system, DBAs may have to work with programmers and analysts, and they are often part of a management team when it comes to overall planning and decision-making.



Opportunities for super-organized DBAs abound. According to the U.S. Bureau of Labor Statistics, this field is expected to be among the fastest growing occupations through 2012. DBAs are vital to magazine publishers who must maintain huge lists of subscribers. They are essential to the government, which must keep volumes of records, and might, for example, need to arrange data to see how actual purchases made compare to amounts budgeted. They are also relied on by insurance companies, financial institutions, and universities, and those who stay abreast of emerging technologies can expect to see more demand for their mastery over information.

# find your database modeler future

## database modeler

Database modeling is a unique new career that has developed as the art of database administration has become more sophisticated. These professionals examine what the purpose of the database is by conducting interviews and meetings and analyzing reports, documents, computer programs, and software. After thoroughly processing the collected information, the modeler can define the issues and goals.

Modelers take the information they gather and then physically visualize how data can be structured and interrelated by drawing diagrams. These diagrams are often called E-R Models. The “E” means entity, which is basically a group of information that has been identified as important to the operation. The “R” means relationship, and the model shows how different entities can be related and connected to make them most useful. This diagram consists of several shapes, lines, and characters that represent different aspects. A rectangle with a word in it can represent a category.

A college, for example, could use a database model to organize its class listings. The listings have many objects—professors, courses, room numbers, times, etc. Each object has defining attributes—courses have scheduled times, instructors teach certain courses, etc. So there is a relationship that can be drawn between these entities. In sales, the

## Get Started Now!

### Prepare yourself with the following tips:

- Analytic skills are crucial, so take as many courses involving problem-solving as you can, and try exercises in puzzle books that test your logic.
- Some experience with databases can be helpful. See if you can lend a hand developing a database in a school office, local business, or even at home.

explore your options



### Search It!

Association of Database Developers at [www.databaseassociation.com](http://www.databaseassociation.com)



### Read It!

DM Review at [www.dmreview.com](http://www.dmreview.com) and dbazine at [www.dbazine.com](http://www.dbazine.com)



### Learn It!

- Master's or doctoral degree in information technology and management, statistics, or econometrics
- Specialized training offered through database product manufacturers such as Oracle ([www.oracle.com](http://www.oracle.com))



### Earn It!

Average annual salary ranges between \$60,000 and \$90,000. (Source: Analytic Recruiting Inc. job listings)



### Find It!

Find opportunities with a wide range of companies including Oracle ([www.oracle.com](http://www.oracle.com)), Microsoft ([www.microsoft.com](http://www.microsoft.com)), and Sybase ([www.sybase.com](http://www.sybase.com)).

## Hire Yourself!

**D**ata modeling is all about drawing diagrams and charts that show relationships between or among different sets of information. Get some practice by building a model based on the various characteristics of the people in your class. Make a list of all the recognizable details you can think of (i.e., tall, short, male, female, etc). Use a software program or markers and poster board to create a chart representing your findings.

modeler may be looking at product purchases, information requests, leads, etc. By visualizing these categories and connections, modelers can come up with the best ways to utilize the data.

The interesting thing about this career is that you don't necessarily need to be technically-minded to succeed. In fact, the skills needed for logical data modeling—abstract thinking, conceptual design, and communication—are often different from the skills of a programmer or systems administrator. Communication skills can be especially important as data modelers will usually present the completed model to database professionals and write concise documentation to support their models. Modelers also listen carefully to users to make sure the database is meeting their needs. In addition to knowing the basics of storing, retrieving, and manipulating data, modelers need to use standardized modeling tools—Erwin, Oracle Designer, PowerDesigner, or ER/Studio. They also learn structured query language, or SQL (pronounced “sequel”), which is the standardized language for building databases or data management systems.

Database modeling is used in many different industries. Even the National Thoroughbred Racing Association (NTRA) has used modeling to find new customers who “look like” their current customers. The modeling program at Santa Anita is known as Thoroughbred Lookalikes. First modelers identified demographic and behavioral characteristics of current member. They then matched those characteristics with a database of nonmembers. Those who share similar characteristics are called “lookalikes,” and they’re invited out for a day at the races. Studies show a high percentage of these “lookalikes” become regulars at the track.

## Hire Yourself!

**B**ecause a lot of success stories in this industry are in niche publishing, a publishing entrepreneur is coming to you for ideas on very specific magazines directed toward very specific audiences—such as a magazine on skateboard design for skateboard enthusiasts or a newsletter of test prep for those soon taking the SAT or a magazine on the hottest band for their fans. Create a preliminary business plan that describes the target audience, the proposed magazine's content, and suggested names for the magazine. Look on-line or in magazines for graphics that capture the look and feel you envision for this publication and include samples with your plan.

software really lets an art director go wild when it comes to stretching, coloring, and transforming drawings and photographs.

Published materials can be incredibly diverse—menus, advertising campaigns, books, catalogs, business cards, calendars, newsletters, newspapers, packaging, and tickets. A look at the magazine world alone shows that topics range widely, from bodybuilding to modern brides to rock and roll.

As technology has become more user friendly, companies have brought a lot of publishing work in-house so they can do it themselves. And advances keep improving the process. For instance, final color proofing can now be done on-line. With the spread of electronic materials, publishers have to get up to speed on hypertext markup language (HTML) and methods for making art and text Internet-ready. For those in managing roles, it pays to know specifics of printing as well—different paper weights, inks, binding, shipping methods, etc.

Probably the biggest headache for anyone in publishing is deadline pressure. Projects have to be produced on time and that often means working long, irregular hours. To get business, publishers rely on polished communication and people skills to win clients and complete jobs according to their specifications. So, a way with words is vital in customer relations and an artistic eye is vital to producing winning materials, in addition to knowing the technical end of desktop publishing.

Desktop publishing should experience faster than average employment growth, according to the U.S. Bureau of Labor Statistics, and desktop publishers' services are in demand from businesses, government agencies, hospitals, and universities. The career can also be very flexible, allowing for a lot of independent work in various locations.

# find desktop publisher your future

## desktop publisher

From big publishing houses to small at-home operations, desktop publishing is the way magazines, newsletters, books, and all manner of printed material are produced nowadays. Any time personal computers or workstations are used to make high-quality documents, that's desktop publishing. Files can be output directly to a printer or formatted so that a printing house can convert them into plates or film for printing. Actually, a growing amount of published material isn't even printed—it's presented on-line through various websites.

A particularly important feature of desktop publishing systems is that they enable you to see on a display screen exactly what will be printed—a feature called WYSIWYG (what you see is what you get). Once the desktop pro has mastered the software, he or she can combine text, photographs, charts, and other visuals to produce publication-ready material. How much editorial or artwork a publisher does depends on the project, and while some do both editorial work and art design, more often those two roles are separate. Those handling the art especially have to learn about the different software to scan images into the system, manipulate those images, and design page layouts. Sophisticated

## Get Started Now!

**Want to stop the presses and see your ideas in print?**

**Start your career exploration here:**

- Read as many publications as possible with an eye for design and an ear for the tone of voice used throughout. Examine how the printed matter is constructed—the number of pages, the type of paper, how it is bound together.
- Get hands-on experience with the school newspaper, literary magazine, or yearbook. An internship with a company is another great way to gain experience.

**explore your options**



### Search It!

Online Publishers Association at [www.online-publishers.org](http://www.online-publishers.org) and Small Publishers Association of North America at [www.spannet.org](http://www.spannet.org)



### Read It!

DesktopPublishing.com at [www.desktoppublishing.com](http://www.desktoppublishing.com)



### Learn It!

- Two-year degree in graphic arts or design
- Bachelor's degree in art, graphic arts, or graphic communications



### Earn It!

Median annual salary is \$30,600.  
(Source: U.S. Department of Labor)



### Find It!

Although many desktop publishers are self-employed, major publishers also employ them. For example, see Hearst Corporation ([www.hearst.com](http://www.hearst.com)) and McGraw-Hill ([www.mcgraw-hill.com](http://www.mcgraw-hill.com)).

# find e-commerce your administrator future

## e-commerce administrator

In some ways, the Internet can be viewed as the world's biggest shopping mall. Every day, millions of people pass through and shop for books, CDs, clothes, wine, medicine, airline tickets, antiques—you name it. Nowadays you can buy almost anything on-line. For those interested in a cutting-edge business career, e-commerce, or electronic commerce, is the place to be. Business is booming for "e-tailers" who master the technology and on-line selling techniques. According to Deloitte Consulting, world e-commerce revenue was at a trillion dollars in 2002. Dell Computers reportedly sells \$30 million worth of gear from its website, and eBay has more than 5 million registered users.

### Get Started Now!

**Step right up! Get yourself a career in the world of e-commerce and begin today by doing the following:**

- Explore websites that sell products, and keep notes on how they present items and the process for making purchases. Jot down why you think the website is successful or not.
- See if there is a technology club you can join at your school. Look into the high-tech clubs at major universities as well.
- Learn website building basics. Take a course in applicable programming languages and software—JavaScript, DHTML, XML, Dreamweaver MX, Fireworks MX, Flash MX, and Cold Fusion MX. To find out what not to do when building a website, visit [www.websitetsthatssuck.com](http://www.websitetsthatssuck.com).

**explore your options**



#### Search It!

American E-Commerce Association at [www.aeaus.com](http://www.aeaus.com) and Institute of Certified E-Commerce Consultants at [www.icecc.com](http://www.icecc.com)



#### Read It!

E-commerce Times at [www.ecommerceetimes.com](http://www.ecommerceetimes.com)



#### Learn It!

- Bachelor's or master's degree in business administration is helpful, but not officially required
- For information about colleges offering courses in e-commerce, visit the ICECC website at [www.icecc.com](http://www.icecc.com)



#### Earn It!

Median annual salary is \$65,000.  
(Source: PayScale.com)



#### Find It!

Look into eBay ([www.ebay.com](http://www.ebay.com)), Travelocity ([www.travelocity.com](http://www.travelocity.com)), MP3 ([www.mp3.com](http://www.mp3.com)), and Amazon.com ([www.amazon.com](http://www.amazon.com)).

## Hire Yourself!

A teen marketing firm has come to you as the expert of all things young people like. They want you to suggest a product line to sell on-line that teens will find irresistible. Your job is then to outline features on the website that will make it exciting for teens to visit and keep them coming back for more. What kind of products do you think your peers are most likely to buy on-line? What will the name of the site be? How will young people find out about it? What makes your site different from other similar sites? Answer these questions in a preliminary business proposal and be prepared to sell your ideas to the client.

E-commerce administrators know the details of setting up businesses to sell in this potentially lucrative cybermarket. Their roles may vary from one firm to another, but these administrators are experts on Internet sales technology and practices. One of the first steps in e-commerce is opening up the store, which on-line means launching an attractive, easy-to-navigate website. The website clearly defines the business and explains why a customer should shop there. Administrators advise businesses on what goes into making an attractive site that will keep Web surfers coming back. To drive people to the site, administrators may recommend advertising and marketing campaigns. Once at the site, customers have to be able to easily browse through products. Administrators want to keep their customers happy, and this often requires creative thinking. For example, to help on-line clothes shoppers, a few apparel firms have figured out a way to present 3-D virtual models who wear the latest fashions. The size of the cybermodel can be adjusted to match the size of the buyer.

Once customers have identified their selections, they must be able to place them in electronic “shopping carts” for purchase. To finalize the transaction, shoppers complete on-line forms giving essential information regarding their address and credit card. Typically, administrators are in charge of setting up a secure system to accept credit card payment. Customers want to be certain that their credit card info will not be stolen by cyber thieves. When a buyer provides information, a system needs to be in place to capture the details and a database must be maintained for mailings and future promotions. Eventually, the customer’s mailing information is relayed to the shipping department, so products can be delivered promptly. Administrators coordinate how customer service will be handled as well. Shoppers may want to ask questions on-

line and customer service representatives need a system to respond. Administrators may also keep track of inventory and total sales, perhaps consulting with a database manager and bookkeeper.

Although e-commerce pros often work with a team of professionals from Web designers to computer technicians, they may wear many hats themselves, especially if they operate their own business. Because some of the software has become so easy to use, an entrepreneur can be his or her own e-commerce administrator, setting up a webpage and a simple system to capture address and credit card information.

The millennium may have begun with a dot-com bust, but businesses are certainly turning to the Web to generate sales. Traditional mail-order companies such as Lands' End, L.L. Bean, and Williams-Sonoma have all been building an on-line niche, and major retailers like Wal-Mart and Target hope to capture a portion of the on-line market as well.

Basic Web knowledge can really help the e-commerce administrator. It's important to know what makes a dynamic website that is responsive to user needs; what the techniques are for getting more "hits" or visits to the site; and what the security options are and how they are operated. The administrator has to constantly keep up with the latest Internet technology and the client's needs to improve the website. When a problem comes up—such as customers reporting a lot of browser errors on the site—the Web-smart administrator can figure out corrective measures to be taken. If a website isn't working on a lot of browsers, those are customers lost.

Electronic commerce is expected to accelerate in the years to come. Because of the growth, even high schools are teaching the subject—the California Department of Education's High School Initiatives Office has developed a new e-commerce curriculum for business, marketing, and entrepreneurship education. Those who are both business- and technologically-minded are wise to learn the ways of marketing on the Web.





#### **Search It!**

Network Professional Association at [www.npanet.org](http://www.npanet.org)



#### **Read It!**

Network Computing at [www.networkcomputing.com](http://www.networkcomputing.com) and Network Magazine at [www.networkmagazine.com](http://www.networkmagazine.com)



#### **Learn It!**

- At least an associate's or bachelor's degree in computer science or information systems
- Some software vendors such as Cisco ([www.cisco.com](http://www.cisco.com)), offer certification programs in network design and systems



#### **Earn It!**

Median annual salary is \$58,400. (Source: Computerworld Survey for network administrators)



#### **Find It!**

Check opportunities with McDonald's ([www.mcdonalds.com](http://www.mcdonalds.com)), PricewaterhouseCoopers ([www.pwccglobal.com](http://www.pwccglobal.com)), and AT&T ([www.att.com](http://www.att.com)).

# **find your global network architect future**

## **global network architect**

Keeping people connected is the job of the global network architect. With telecommuting and the demand for sharing data both on the rise, professionals are needed who understand how to connect workers via computers. As technologies involving communication and information grow increasingly sophisticated, the network architect has learned how to bring together Internet, voice, data, and cable capabilities.

A few years ago, the term *network architect* didn't exist. Networks were relatively simple—a few office workers sharing information on a server. Now, networks reach different geographic locations, use many

## **Get Started Now!**

**Want to keep the world connected? Start with your analytic mind and computer skills.**

- Problem-solving skills are essential, so you may want to sharpen your wits by doing extra-credit math-related problems or challenging logic puzzles.
- Learn the language of networking by reading about the subject on-line. Learn terms such as MPLS (multi-protocol label switching), a method to more efficiently move and manage traffic across the network. Check out topics such as TCP/IP, Novell's IPX, Apple's AppleTalk, IBM's SNA (systems network architecture), and Digital Equipment's DECnet.
- See if you can assist in any networking work at your school or in a part-time job in a local business. An employer or a school may have a local area network that needs maintaining and updating and you may be able to lend a hand and learn some basics.

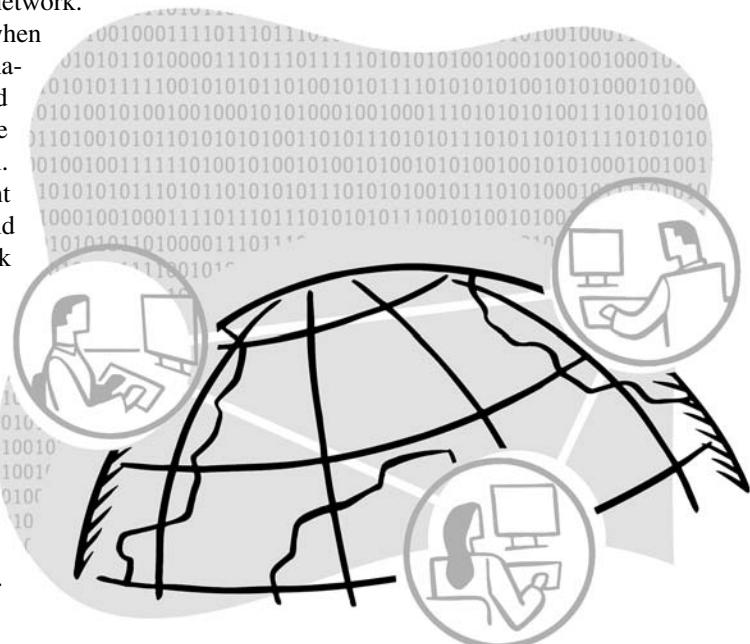
## Hire Yourself!

**N**etworking practice can begin at home. If you're able to connect to the Internet, you should be able to write a list of at least five suggestions that could improve your on-line connection and Internet work. Possibilities may range from increasing bandwidth for a faster connection to taking precautions to protect your computer against viruses. Also, include information about the costs, equipment, or software associated with each suggestion.

different applications and software, and handle many more users and lots of information. Today most networks are global networks because they work in a global economy and they can be accessed from anywhere in the world. Executives can check e-mail from Tokyo, technical writers can access files on the company server at home, salespeople and field technicians can travel anywhere and still connect to company resources. Wherever workers go, they can take their office with them.

The architects not only build these complex network systems, they plan, design, update, and operate them. Network architects decide on services, functions, and how procedures should be carried out. Many network architects deal with security issues, making sure only authorized users can gain access to the network.

Congestion can be a problem as well when too many users are trying to get information, and architects are often concerned with server capacity, making sure enough room exists to store information. Architects also know the right equipment for the job. Connections are made and maintained by devices and black boxes—bridges, concentrators, gateways, hubs, multiplexers, and routers (devices that forward data packets along networks). Architects are very familiar with technical procedures such as multicasting (sending a message from a single input port to multiple output ports). Ultimately their goal is to provide high performance, accessibility, and reliability in networks.



Other roles a network architect takes on may be that of tech support analyst, looking for potential problems and heading them off. Or they serve as financial analysts, reviewing costs and expenses of a network, or even work as technical writers, documenting work that has been done and instructing how to use equipment.

Advancements in technology continue to make this an interesting field. Network specialists are updating systems with high-bandwidth connections that make connecting speedier. And they're exploring the potential of VoIP, or Voice over Internet Protocol, a system that can make long-distance calls incredibly cheap by converting a user's voice into small packs of digital data that can then be sent over networks to a receiving computer. The receiving computer translates the digital information into an audio signal that sounds like a normal voice. It's like the sound version of instant messaging.

Network architects are multitalented, but at their core they love computer systems and are quick, logical problem-solvers. Jobs in this field should be plentiful. According to a recent study by IT placement agency Robert Half International Consulting, networking is the most in-demand of all the IT specialties.

# find your hardware engineer future

## hardware engineer

Computer technology basically divides into two areas: software and hardware. Software is the information that tells a computer what to do, and hardware is the computer itself. You can think of hardware as everything you can touch—computer chips, circuit boards, memory components, disk drives, display screens, keyboards, and printers. Computer hardware engineers (often called computer engineers) build these computer parts. Their handiwork is everywhere today—in your PC, in your laptop, in handheld devices, in robotics on assembly lines, and even in technology that is embedded in appliances and cell phones. A Sony PlayStation, for example, is really a computer with a custom-designed processor making billions of calculations per second.

As you can imagine, building a computer requires several stages of work—research, planning, design, development, and testing. The process usually begins with hardware engineers looking for ways to

### Get Started Now!

- Strengthen your knowledge of math, science, and computers by taking as many advanced courses in these subjects as you can.
- Building computers really begins with a fundamental understanding of electronics, so take what courses in this field you can. Check if your school offers electric shop or after-school clubs where they you can build electric models.
- A knack for building electronic devices can be a stepping stone into computer engineering. To hone your skills, try constructing simple electronics from kits available at hobby stores. Explore websites that explain how to build your own computer such as My Super PC at [www.mysuperpc.com](http://www.mysuperpc.com) or Build Your Own Computer at [www.buildyourowncomputer.net](http://www.buildyourowncomputer.net).



#### Search It!

IEEE Computer Society at  
[www.computer.org](http://www.computer.org)



#### Read It!

ITProfessional at [www.computer.org/itpro](http://www.computer.org/itpro)



#### Learn It!

- A bachelor's degree in computer science, information science or systems, or computer engineering
- For information about colleges offering related courses, visit the Computing Research Association ([www.cra.org](http://www.cra.org))



#### Earn It!

Median annual salary is \$67,300.  
(Source: U.S. Bureau of Labor Statistics)



#### Find It!

Check out Intel ([www.intel.com](http://www.intel.com)), Hitachi ([www.hitachi.com](http://www.hitachi.com)), Advanced Micro Devices ([www.amd.com](http://www.amd.com)), and Gateway ([www.gateway.com](http://www.gateway.com)). For a complete list of jobs, visit EngineerJobs at [www.engineerjobs.com](http://www.engineerjobs.com).

## Hire Yourself!

**A**n architectural firm wants to build a model home of the future but needs help getting ideas on how to automate different features. The firm wants you, the hardware engineer, to tell them what functions in the home could be controlled by computer components. As an inventor of sorts, you might suggest using computers to automatically turn on lights or activate an alarm system when you lock the front door. Make a descriptive list of other computer gizmos that can make life easier in the home of the future. For an extra challenge, illustrate your list with diagrams of how your recommended technological gadgets might look and work.

improve the speed, efficiency, performance, and safety of equipment. As they develop and invent new components, engineers use scientific analysis and mathematical models to predict and measure the outcome of their designs. By creating circuit diagrams and blueprints, the engineers can show exactly how their components should be constructed. As the process moves from the idea stage to production, engineers often take on a systems analyst role—figuring out software requirements and cost-effective methods of production.

When their idea is finally on the assembly line, engineers often play a role supervising the production. Sometimes collaborating with a technical writer, computer engineers write a description of a product's capabilities, as well as detailed instructions on installation, use, and maintenance. They may need to specify power supply requirements and configuration, as well as ways to control dust, temperature, and humidity.

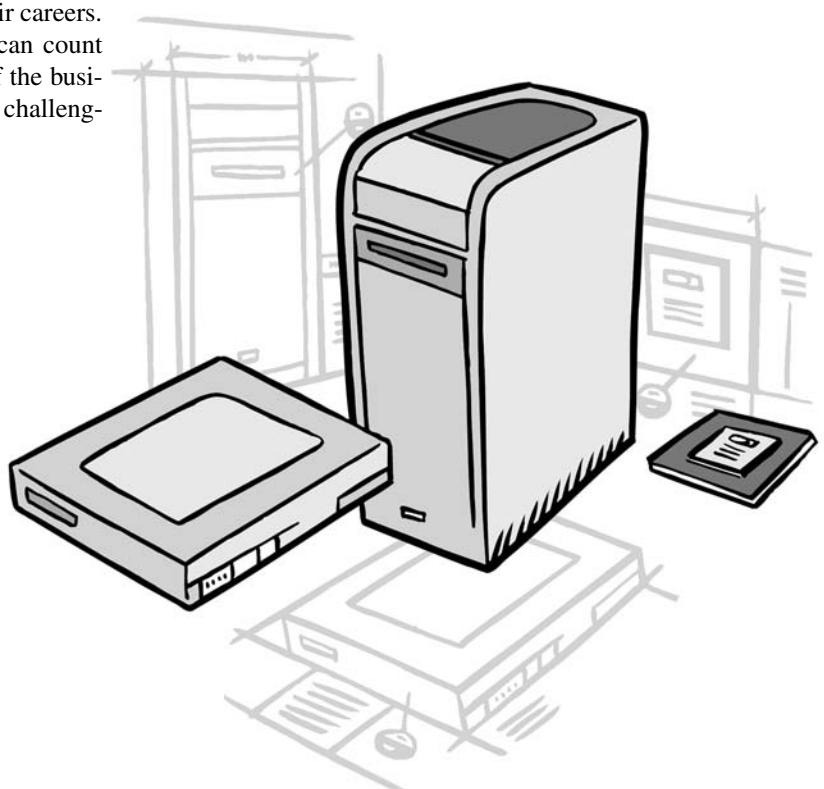
After a product is in use, the engineer pays close attention to user evaluations so improvements can be made. If the hardware was built for data processing managers, for example, the engineer will want to hear of any limitations and needs to learn if it is operating the way it was designed to operate.

Hardware engineering requires a lot of advanced training to handle the mathematical problem-solving, electrical engineering, programming, and computer-aided design (CAD) used to create geometric models of components. Communication skills are vital when working in teams with other technology professionals, and often business skills help when it comes to resource allocation, strategic planning, production methods, and coordination of workers.

Currently, about 25 percent of computer hardware engineers work in computer and data processing services, and many are employed as consultants for businesses needing help managing, upgrading, and customizing increasingly complex systems.

But it's the rapid advancements in technology that are really sparking opportunities. Look at computer chips. In 1965, Gordon Moore, one of Intel's cofounders, said that the computer chip will double in power every 18 months to two years by increasing the number of transistors, resistors, and capacitors manufactured on a single chip. This became known as Moore's Law and it has held true for almost 30 years. Powerful chips have made possible computers with speech and hand-writing recognition, as well as multi-media capabilities to support real-time, full-color, high-resolution, and 3-D simulation. One problem that tomorrow's engineers will have to address is the excessive amount of heat generated by microprocessors that have so many switches etched into them. Some researchers foresee a new technology with biochips, a mixture of organic and inorganic components that would offer greater storage capacity than current technology.

To keep up with all the technological advancements, hardware engineers take courses throughout their careers. Prospective hardware engineers can count on the rapidly changing nature of the business to make this an exciting and challenging field.





#### **Search It!**

Alisomar Institute for Information Architecture at [www.aifia.org](http://www.aifia.org) and the Society for Technical Communication Information Design Special Interest Group (STC IDSIG) at [www.stcsig.org/id/index.html](http://www.stcsig.org/id/index.html)



#### **Read It!**

Boxesandarrows at [www.boxesandarrows.com](http://www.boxesandarrows.com) and Design Matters at [www.stcsig.org/id/newsletter.html](http://www.stcsig.org/id/newsletter.html)



#### **Learn It!**

Bachelor's degree in information management, computer science, or infomation architecture.



#### **Earn It!**

Average annual salary is \$50,000+.

(Source: *Boxes and Arrows*)



#### **Find It!**

Check AOL ([www.aol.com](http://www.aol.com)), Netscape ([www.netscape.com](http://www.netscape.com)), SBI.Razorfish ([www.sbigroup.com](http://www.sbigroup.com)), and even an education organization like the Children's Television Workshop—home of *Sesame Street* ([www.ctw.org](http://www.ctw.org)).

# find information **your architect** future

## **information architect**

As the technological world has expanded at a furious rate, new careers seemingly pop up over night, and they're all very specialized. Quite a few deal with delivering information and instructions in a clear and concise manner. These careers include usability expert, technical writer, Webmaster, and information architect (IA). Although the duties of an information architect may often overlap with these other careers, the overall job is to take content and present it in an effective structure.

Often, the information architect will be working with a website to make sure information is well presented and formatted in an easy-to-use graphical user interface (GUI). Both communication and design skills are essential to explain and illustrate the functions on a site. In the IT world some experts make a distinction between information architects,

## **Get Started Now!**

**IAs want to build a friendly technological world. If you want to join them, start by doing the following:**

- Go exploring on the Internet and give websites a critical going-over. Think about how easy a site is to use and if it is achieving its goals.
- Your number one priority should be to fine-tune your communication skills. You might consider working at the school newspaper to get accustomed to translating information into reader-friendly material.
- Learn basic Web design now. Sign up for a class in standard Web design software, such as Dreamweaver or Microsoft Frontpage.

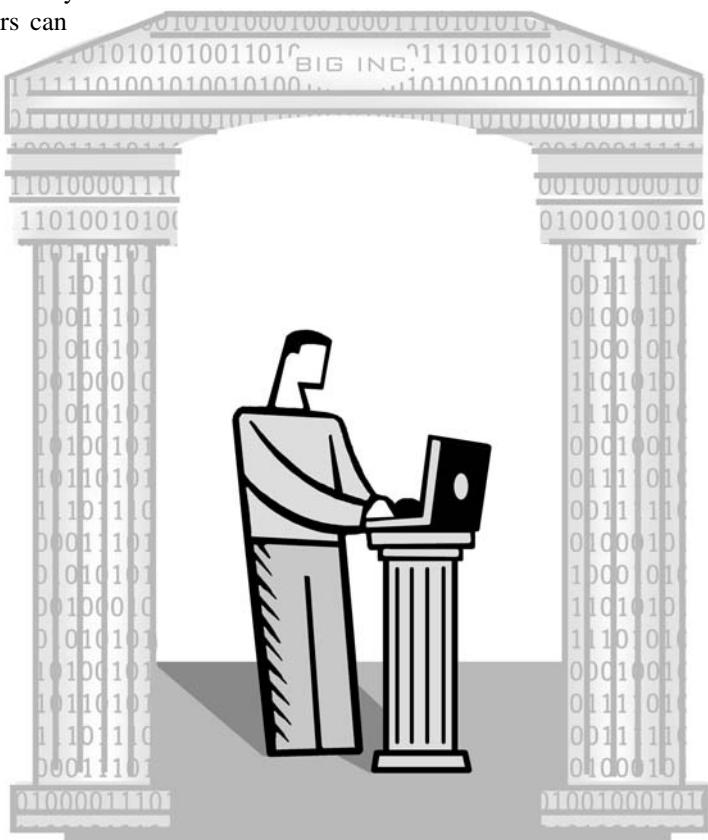
## Hire Yourself!

**T**hink of a subject you would like to cover in a website and then create a navigational map on paper. Show the different windows and explain why you've created different links. Try to see the website through the eyes of a first-time user. What kinds of icons and features does the website need to be straightforward and easy to use?

who write the words and think of the overall structure, and information designers, who bring together all the graphic elements. Some academics say architects are concerned with cognition and are more language-oriented, while designers are concerned with perception and are more graphically oriented. But in the workplace, the architect and designer are often the same person.

IAs design with an eye toward simplicity—they want a site that is easy to navigate and that users can teach themselves how to operate. Frequently, the job requires taking complex data and simplifying it and organizing it in a way that is readily digestible. For the clients, IAs make sure the site can be updated and expanded with little effort. In developing a site, they typically work with project managers, editors, programmers, and designers, or they take on some of those roles themselves.

Demand for IAs will only increase as businesses continue to deliver their information in multiple forms using multiple technologies. As the workplace becomes more competitive, IAs really have no choice but to master a range of skills—information organization, graphic design, multi-tasking, writing, screen layout, Web client-server scripting, human-computer interaction design, instructional design, and usability testing.





#### **Search It!**

Association of Independent Information Professionals at  
[www.aiip.org](http://www.aiip.org)



#### **Read It!**

*IB: A Resource Guide for the Independent Information Professional* at [www.aiip.org/Resources/IBResourceGuide.htm](http://www.aiip.org/Resources/IBResourceGuide.htm)



#### **Learn It!**

Although information brokers often have a master's degree in library science (MLS), they come from all different educational backgrounds, including law, science, business, and journalism.



#### **Earn It!**

Average annual salary is \$62,400.  
(Source: WorkAtHomeIndex)



#### **Find It!**

Although some information brokers are self-employed, many work for big database vendors such as Dow Jones ([www.dowjones.com](http://www.dowjones.com)), LexisNexis Research System ([www.lexis.com](http://www.lexis.com)), and Dialog ([www.dialog.com](http://www.dialog.com)).

# **find information your broker future**

## **information broker**

We are living in the "Information Age," so it should come as no surprise that one of the hottest commodities in the world is information. People and businesses are always searching for information, but finding the right facts and figures is not always so easy. That's where the information broker (IB) steps in.

Information brokers have access to many databases, and for a price, they find the information clients need. As professional surfers of the Web, they know how to access reams of data on-line. But they also do off-line digging for more obscure topics. They deliver documents, summaries of Web-based information, copies of published articles, and similar material to academic, business, and professional groups. In addition to retrieving and organizing information, they may be hired to analyze and consult on the use and management of data. Their final reports can play a key role in their client's decision-making process and the reports must be put together in a presentable manner.

## **Get Started Now!**

**Does the idea of transforming yourself into a super-research powerhouse get your heart racing? You may want to take some first steps toward becoming an information broker:**

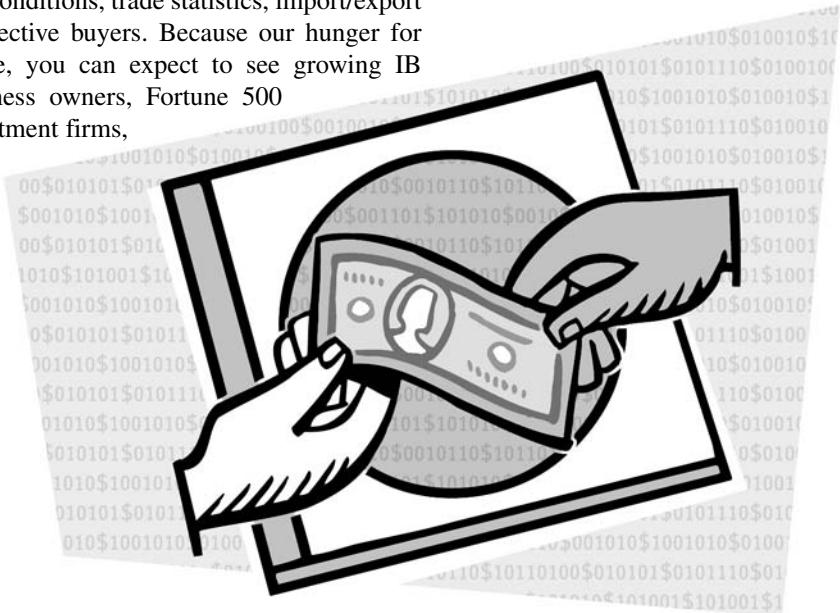
- If you haven't already, familiarize yourself with on-line search engines. Look up your favorite topics on Google, Yahoo, or another service.
- Volunteer at the library. A lot of those information-organizing skills translate to this career.
- A mentor can help teach you the fundamentals. Look into AIIP's mentoring program at [www.marketingbase.com/mentor.html](http://www.marketingbase.com/mentor.html).

# Hire Yourself!

**R**esearch is everything for the information broker. A new museum is looking to hire an information broker, but potential candidates must first submit a list of 20 sources on an artist of their choice. To get the job, pick an artist you like, go on-line, and start to put together a list of websites that provide relevant information. Need help? Try using the research tools found at [www.itools.com](http://www.itools.com).

Because success depends on knowing the client's needs and expectations, brokers have to ask some probing questions: What format does the client want? Does the client just want raw data or a formal report? What is the information being used for? What information does the client already have? Does the client want to rely on just on-line sources? What's the time frame? When are results needed? Once the job is clearly defined, brokers can become hermits, spending long stretches gathering information. It's detailed work that requires a lot of focus and self-motivation.

IBs become experts on finding business, medicine, legal, government, or science information. In the business world, an entrepreneur may want to expand her business to China. Before doing so, she may turn to the IB to gather some basic information on how to export, studies on current world economic conditions, trade statistics, import/export trends, and databases of prospective buyers. Because our hunger for information seems unstoppable, you can expect to see growing IB opportunities with small business owners, Fortune 500 companies, insurance and investment firms, advertising and public relations agencies, and manufacturing and service industries.





#### **Search It!**

TechLearn at [www.techlearn.com](http://www.techlearn.com) and Association for Educational Communications and Technology at [www.aect.org](http://www.aect.org)



#### **Read It!**

Instructional System Design (ISD) Handbook at [www.nwlink.com/~donclark/hrd/sat.html](http://www.nwlink.com/~donclark/hrd/sat.html)



#### **Learn It!**

- A bachelor's degree in education, instructional design, instructional technology, or a related field
- A master of science in computer education and cognitive systems with a specialization in instructional systems technology



#### **Earn It!**

Average wage is \$18 to \$24 per hour.

(Source: Jobs.com)



#### **Find It!**

Potential employers include Socratic Arts ([www.socraticarts.com](http://www.socraticarts.com)) and Cognitive Arts ([www.cognitivearts.com](http://www.cognitivearts.com)).

# **find instructional your designer future**

## **instructional designer**

“My computer just gave me an A!” It may sound futuristic to think of computers replacing your teachers, but for some training, computer courses are able to do the job without a teacher on hand. Computer-based training (CBT) and Web-based training (WBT) or Internet-based training (IBT) are typically developed by instructional designers or instructional systems designers.

This type of training is a great teaching method when students are not near a school, since learners can access the Internet or view a CD-ROM from their homes. Plus, this type of e-learning (electronic learning) allows students to study at their own pace and on their own schedules. And it means any number of students can take a course at once. Creating technology-based training can be expensive, but companies, colleges, and other institutions have realized great savings because

## **Get Started Now!**

**If you're ready to teach the world via computers,  
here's how to get started:**

- You'll need to get a grasp of how people teach and how people learn. If you get the opportunity to teach a class of any sort, take it. You may want to ask a teacher if you can help develop a lesson plan for a class session.
- Investigate on-line courses that are offered and take notes on how a few operate. If you thoroughly search the Internet, you might be able to find a few free ones on-line.
- Find out about programs and software that allow for testing. Being able to set up a system where users can test themselves is a key component in instructional design.

## Hire Yourself!

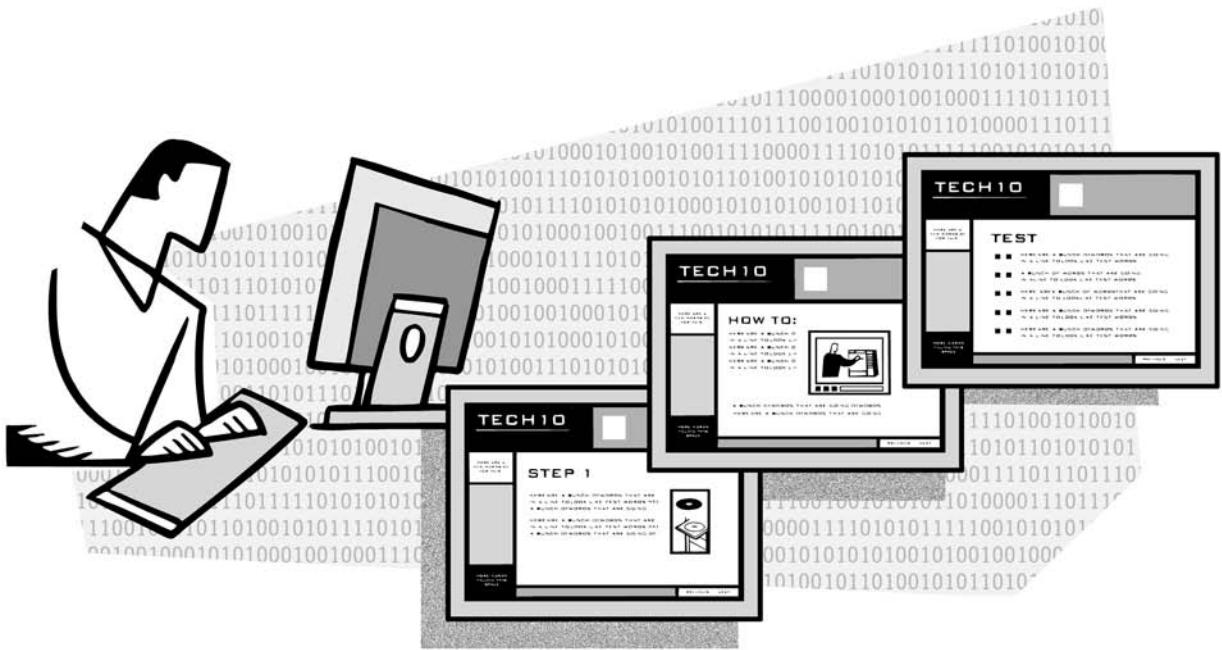
Your school has selected you to teach an hour-long course on any subject you like—from snowboarding to your favorite movie. Pick a subject that inspires you and then use the steps that instructional designers use to do their job: Analyze who your audience is and your goals. Outline your course content and describe learning activities that engage students in learning more about the subject. Put together a lesson plan that incorporates your analysis, outline, and ideas for learning activities.

the cost of training each individual can be very small. For example, a pharmaceutical company needing to educate salespeople across the country about new drugs can do so with an on-line course (as opposed to flying them all in and putting them up for a week of lectures).

To develop an on-line or computerized course, an instructional designer typically goes through five stages. First, there's the analysis stage, figuring out what is to be learned and by whom. Then comes design, charting how the material is to be presented and tested with flowcharts and storyboards. Once the design is agreed on, the course will go into real development, producing the actual training materials. When the course is ready, next comes implementation, or the plan for having the materials reach the audience. After the audience has been training with the materials, the program must be evaluated, using collected user information on effectiveness and suggestions on how improvements can be made.

For all on-line training, students learn by connecting to an instructional program stored on a remote server. Often the courses are problem-based, so users can test themselves as they go and receive immediate feedback and answers. Animation, video, and other media may be part of the experience to keep students interested. In addition to completing the coursework, students can sometimes electronically communicate with trainers or instructors, asking questions and receiving responses.

At a big firm, instructional designers are often part of the performance management team. Their goal is to make better, smarter workers and improve their performance. Sometimes these professionals also create materials for a classroom setting, such as printed manuals and worksheets. The job combines communication, graphics, programming, and human performance technology skills. The job demands keen organizational powers and the ability to research, analyze, and



summarize data. Statistics often come into play as well when summing up research results. Instructional designers often work as part of a team with on-line editors, visual designers, media developers, Web developers, and testing specialists.

Because corporate America is realizing savings with this type of technology-based training (as is the military, the government, and institutes of higher learning), job growth in this field should be very strong. For those who are interested in education, it's a real cutting-edge niche worth exploring.

# find multimedia your developer future

## multimedia developer

If you're a frequent Internet traveler, you know that websites really can dazzle the senses with streaming video clips, music, and interactive quizzes and games. Multimedia designers bring these elements together to deliver a message with punch. Whether the work is for a website or in the form of a CD-ROM, these designers use state-of-the-art software to create stimulating presentations.

This use of audio, video, animation, and other unique formats on the Web and especially for on-line advertising is often called rich media—its defining characteristic is that it has dynamic motion. Rich media can

### Get Started Now!

**If you're seeking a multidimensional career, then consider multimedia design. To prepare, follow these tips:**

- Experience is the best entry into this field, so try to intern, volunteer, or work part time at a game design firm, a software development company, an educational marketing firm, or an advertising firm.
- Try out multimedia websites at home. Download media players on-line (many are available for free), and then try to see the short films that many websites provide. One of the biggest challenges can be bandwidth; if you're connecting via modem it can take a long time to view a film. Also, if your computer does not have enough memory allotted for these functions, they will operate slowly or not at all. To connect to some sites worth checking out, visit World Village ([www.worldvillage.com](http://www.worldvillage.com)).

**explore your options**



#### Search It!

Association for Multimedia Communications (AMC) at  
[www.amcomm.org](http://www.amcomm.org)



#### Read It!

IEEE Multimedia at [www.computer.org/multimedia/index.htm](http://www.computer.org/multimedia/index.htm)



#### Learn It!

- A degree or certificate in information technology with an emphasis on multimedia can be helpful
- Many technical and trade schools now offer training in multimedia



#### Earn It!

Average annual salary ranges from \$54,000 to \$77,750.

(Source: Robert Half International data for software developers)



#### Find It!

Check Macromedia ([www.macromedia.com](http://www.macromedia.com)), Vivendi Universal Games ([www.vugames.com](http://www.vugames.com)), Phinney/Bischoff design-house ([www.pbdh.com](http://www.pbdh.com)), and Iknowthat.com ([www.iknowthat.com](http://www.iknowthat.com)).

## Hire Yourself!

A major record label wants to hire a young creative thinker for its multimedia department. To test creative ability, label executives want to see in-person presentations by students about their favorite artist. They want the presentation to contain as many audio and visual elements as possible. Use Microsoft PowerPoint or another software program to create a multimedia presentation using resources you find on-line.

be downloaded and is typically embedded in a webpage. To see these programs, users need to have a media program, such as Real Network's RealPlayer, Macromedia's Flash, or Apple QuickTime.

Multimedia professionals rely on multiple talents. They either have to be artists, sound engineers, programmers, and writers themselves, or they put together a team to collaborate on building a multimedia project. In many ways they are like movie directors. They oversee a project, coordinating and supervising staff, timelines, and budgets. Sometimes they even hire actors and voice talents to realize their vision.

Breaking into the multimedia business requires experience with different graphic, audio, and video formats. Professionals usually know the tools of interactive design using Photoshop, SoundEdit, Premiere, Netscape, and Astound. Authoring tools or authorware are used for help in writing hypertext or multimedia applications. Exposure to DirectorT, AuthorwareT, and VC++ can be a distinct advantage. The most dynamic websites and CDs take advantage of 3-D computer animation and digital video. As can be expected, the technology is ever-changing, so designers have to keep up with trends to make sure they are using the best tools. In addition to technical skills, the ability to communicate effectively is important to understand and meet client needs.

Because the Web can be limited by bandwidth and file sizes, CD-ROMs have the most capabilities for multimedia. CD-ROMs are great for computer-based training, information kiosks, presentations, and entertainment. Educational institutions have been developing some very effective multimedia lessons providing instruction in medicine, science, and foreign languages. Many companies depend on multimedia programs to train employees and make management presentations. Some digitize their video programs and place them on the Internet or intranet so employees can watch them any time. Those looking to the future picture elaborate multimedia presentations where a hologram of a speaker can be broadcast into a room during a video conference.

# find nanotechnologist your future

## nanotechnologist

In Dr. Seuss's children's book, *Horton Hears a Who!*, an elephant discovers an entire world in a tiny speck. Today, nanotechnologists are practically building those worlds. They are scientists who specialize in the very tiny. Nano itself means "one-billionth," and something that measures one nanometer equals the size of three atoms, or 1/80,000 the diameter of a human hair. Advanced tools are now allowing scientists to construct machines and products that are built atom by atom.

Atomically-engineered materials already surround us, from silicon chips to gigabyte disk drives to light-emitting diodes. IBM researchers have been able to demonstrate a data storage system of 1 trillion bits per square inch—a device that would be able to store 25 million pages of data on the surface of a postage stamp. L'oreal, the cosmetics firm, is a

## Get Started Now!

**Let's get small. Here are some ways to get started exploring the world of nanotechnology.**

- Try to take advanced courses in physics, chemistry, biology, and computers. You need a broad base of knowledge to succeed in this career.
- The government has a strong interest in developing nanotechnology. Visit its National Nanotechnology Initiative at [www.nano.gov](http://www.nano.gov).
- University of Wisconsin is very much involved with the study of nanotechnology, and its website features easy-to-understand information and exercises on the subject, including a book you can download for free called *Exploring the Nanoworld with LEGO Bricks*. Check [www.mrsec.wisc.edu/edetc/LEGO](http://www.mrsec.wisc.edu/edetc/LEGO).



### Search It!

NanoBusiness Alliance at [www.nanobusiness.org](http://www.nanobusiness.org) and Nanotechnology Initiative at [www.nano.gov](http://www.nano.gov)



### Read It!

*Smalltimes* at [www.smalltimes.com](http://www.smalltimes.com)



### Learn It!

- This emerging, multidisciplinary field will require professionals with advanced degrees in computer science, physics, chemistry, biology, or engineering
- Check the list of universities offering courses in nanotechnology at [www.nano.gov](http://www.nano.gov)



### Earn It!

Median annual salary is \$61,400.  
(Source: U.S. Department of Labor)



### Find It!

A variety of organizations are exploring the possibilities of nanotechnology, including IBM ([www.research.ibm.com/nanoscience](http://research.ibm.com/nanoscience)) and L'oreal ([www.loreal.com](http://www.loreal.com)).

## Hire Yourself!

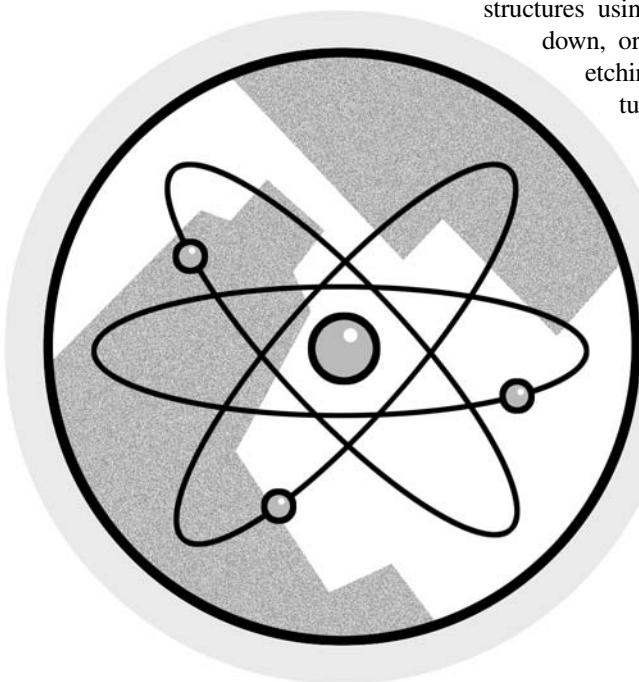
Use resources you find at the How Stuff Works website at [www.howstuffworks.com/search.php](http://www.howstuffworks.com/search.php) to create a poster that compares the difference between how automobiles (or another product of your choice) are currently made and how they may be made in the future using nanotechnology.

big believer in nanotechnology, and uses the principles of nanotechnology to transport ingredients such as Vitamin E to the skin, using nanosomes or nano-size vehicles to transport the active ingredients.

Other fascinating advances in nanotechnology include the development of “memory metals,” which bend or undergo a change when needed and then retain their original shape, and “nanotubes,” which are arrangements of carbon atoms that are strong as steel but weigh six times less.

This science of building minuscule computers and other very small materials requires a broad base of knowledge, especially in physics and engineering, but also chemistry and biology, depending on the project. Those entering the field learn two approaches—bottom-up, or building structures using individual molecular building blocks, and top down, or making nano-sized structures using machine or etching techniques to give nanometer-size design features. Nanotechnologists spend a lot of their time performing research and meeting with corporate and government officials to discuss how this technology can have more practical applications.

Nanotechnology is certainly a revolutionary field and it could change the way we manufacture almost everything—from medicines to computers to automobiles. Those with imagination, excited by research, and capable of understanding advanced technologies may find this a rewarding and challenging occupation.



# find semiconductor your processor future

## semiconductor processor

Without semiconductors (also known as computer chips), a computer would be a lifeless shell. Semiconductors make up the brains of the computer, known in technospeak as the CPU (central processing unit). This is where calculations take place. On a big computer, the CPU may take up one or more circuit boards holding chips and other electronic components. On a personal computer, the CPU can be housed in a single chip called a microprocessor. Semiconductors also make up a computer's memory.

These chips are called semiconductors because they're made of silicon and germanium, materials that are not good at conducting electricity (like copper) or insulating (like rubber). These materials are good for miniaturizing electronic components, such as aluminum wires and electric switches, which manipulate the flow of electrical current. And today's chips are smaller than ever—many are no bigger than a grain of rice.

## Get Started Now!

**Want to cash in on computer chips? Consider this challenging technical trade with plenty of room to learn and get ahead.**

- Take advanced courses in math and the physical sciences.
- Many start out in this field in summer and part-time jobs. Check your yellow pages or local chamber of commerce and see if you live near a semiconductor processing plant. A summer job can lead to part-time work during the school year, and that experience may lead to full-time employment after graduation.

**explore your options**



**Search It!**  
Semiconductor Industry Association at [www.semichips.org](http://www.semichips.org)



**Read It!**  
Semiconductor Manufacturing Magazine at <http://dom semi.org/web/wmmagazine.nsf>



**Learn It!**  
An associate's degree or certification from a community college or technical school specializing in training semiconductor processors.



**Earn It!**  
Median annual salary is \$26,000.  
(Source: U.S. Department of Labor)



**Find It!**  
Some of the major semiconductor manufacturers include Philips ([www.semiconductors.philips.com](http://www.semiconductors.philips.com)), Marvell Technology Group ([www.marvell.com](http://www.marvell.com)), and Intel ([www.intel.com](http://www.intel.com)).

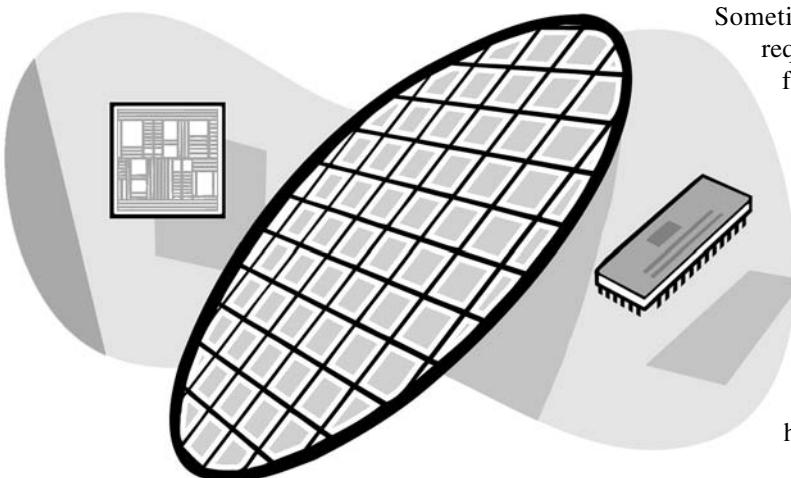
## Hire Yourself!

**G**o on-line to Boin's Semiconductor Links at [www.boin-gmbh.com/linkpage/indhis.htm](http://www.boin-gmbh.com/linkpage/indhis.htm). Here you'll find links to several websites providing information about the history of semiconductors. Use these links (and others you find using a favorite Internet search engine such as Google or Yahoo) to create a timeline illustrating the past and present of semiconductors. Also, include a section on the future of semiconductors, featuring your most creative predictions of new uses for this technology.

Semiconductor processors do the production work to manufacture these chips. They use automated equipment to imprint precise microscopic patterns of wiring on silicon wafers, place computer wiring in these wafers, and cut the wafers into dozens of individual semiconductors. The whole process can take several hundred steps, all controlled by the processor. Because the smallest piece of dust can damage a semiconductor, production is done in an extremely clean environment called a clean room located in a fab, or semiconductor fabricating plant. Lint from normal clothes can ruin semiconductors, so operators and technicians wear special lightweight outer garments known as bunny suits that fit over regular clothing.

You can look at this career as a sophisticated trade—like carpentry or sheet metal work—but because it involves advanced technology, the job demands a grasp of some scientific and engineering principles to operate, maintain, and monitor this manufacturing equipment.

Sometimes quick analytical thinking is required, especially if equipment malfunctions and a problem has to be taken care of fast. To keep up with the rapidly changing technology, processors typically receive annual training at their workplace. Professionals in this field are in hot demand and the need for more is only expected to swell as electronics become increasingly computerized with microchips in everything from home appliances to cars to handheld games to cell phones.

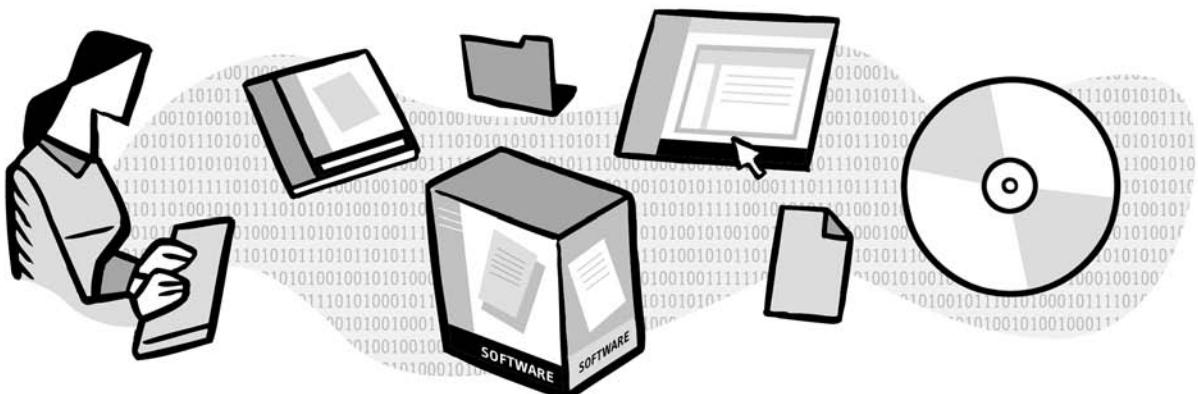


## Hire Yourself!

Here's your chance to "look under the hood" of a typical software program and see not only how it works but why it works. Go on-line to the How Stuff Works website to the section about C programming at <http://computer.howstuffworks.com/>. Use the information you find there, as well as at other resources you find using a favorite Internet browser such as Google and Yahoo. Create a flow chart that explains how programming language becomes the incredible software programs we now use every day.

job over to the computer programmers so they can focus on creating algorithms (sets of steps for solving a problem) and analyzing and solving programming difficulties. Some see the software developers, or engineers, as the "architects" who set the plans and the programmers as the "construction workers" who actually build the programs.

As with so many computer professionals, software developers are looking for ways to make businesses run more efficiently and ways to make our everyday lives easier and more enjoyable. In a corporate setting, designers gather information about a company and its products, people, and clients and then come up with software solutions that may help productivity. After they analyze the operations, they plan a program to achieve the task, then the program is coded and then tested to work out the bugs. A business may, for example, want software designed to organize a large database of magazine subscribers or automate a payroll system. Software is also created to be sold to the general public—whether it be a program to help with personal taxes or a PC



game or software that simplifies the process of building a website, such as Dreamweaver.

On big projects, software developers work in teams, often with other software experts, but sometimes they also collaborate with business managers, hardware engineers, programmers, and the instructional designers and technical writers who ultimately write the user guides to the products. Software developers are very much interested in the user reaction to their products. They can make improvements based on customer and coworker opinions.

This is a perfect career for the self-starter and creative thinker. Successful software developers are always thinking of new, faster, easier ways of doing things. And they are good communicators who can explain their vision and detail the steps needed to make their software a reality. According to the Bureau of Labor Statistics, almost half of all computer software engineers work in the computer and data processing services industry. Many produce prepackaged software. Some create software systems for government agencies, manufacturers, and colleges and universities. As technology continues to advance in areas such as the Internet, e-commerce, and telecommunications, the need for new software will continue to grow.

# find software developer your future

## software developer

If hardware can be viewed as the “body” of a computer, then software is the “brains.” Software is the programming that allows computers to perform specific functions. Without software, a computer would be a lifeless shell. Software can be an operating system, word processor, spreadsheet, game, or database management system. And the brains behind creating these programs are the software developers.

To come up with new software, developers need to be fluent in programming languages such as C, C++, and Java. But designers often don’t do the programming themselves. They turn the coding part of the

### Get Started Now!

**Want computers to do your bidding? Then prepare yourself for a career in software development.**

- Go to the computer store or go on-line and take a look at all the different software packages that are for sale or even available for free, from iTunes to Norton Antivirus to WinZip Computing. Get an understanding of the range of what software can do.
- Programming know-how is essential, so the sooner you gain skills in C++, Java, and other languages, the better. Also, advanced math courses will help, especially those that can hone your skills with algorithms.
- Try downloading shareware from the Internet. This is software that is distributed on the basis of an honor system. Most shareware is available free of charge, but the author usually requests that you pay a small fee if you like the program and use it regularly. Check out [www.simplythebest.net](http://www.simplythebest.net) and look at its shareware and freeware directory.



#### Search It!

IEEE Computer Society at [www.computer.org](http://www.computer.org) and Software & Information Industry Association at [www.spa.org](http://www.spa.org)



#### Read It!

*Developer.\** (the magazine by, for, and about software developers) at [www.developerdotstar.com](http://www.developerdotstar.com)



#### Learn It!

- A bachelor’s degree in computer science, software engineering, or computer information systems
- Professional certification from the Institute for Certification of Computing Professionals ([www.iccp.org](http://www.iccp.org)) can be a plus



#### Earn It!

Average starting salary ranges between \$62,750 and \$92,000. (Source: Robert Half International)



#### Find It!

Some of the major software manufacturers are Apple ([www.apple.com](http://www.apple.com)), Adobe ([www.adobe.com](http://www.adobe.com)), and Corel ([www.corel.com](http://www.corel.com)).



#### **Search It!**

Software Testing Institute at [www.softwaretestinginstitute.com](http://www.softwaretestinginstitute.com)



#### **Read It!**

IEEE Software at [www.computer.org/software](http://www.computer.org/software)



#### **Learn It!**

- Bachelor's degree in computer science or information technology
- Professional certifications such as those offered by the American Society of Quality ([www.asq.org](http://www.asq.org)) and the Quality Assurance Institute ([www.softwarecertifications.com](http://www.softwarecertifications.com)) help advance careers in this field



#### **Earn It!**

Average salary range is \$38,400 to \$76,769.

(Source: Software Testing Institute)



#### **Find It!**

Some of the major software manufacturers are Microsoft ([www.microsoft.com](http://www.microsoft.com)) and Motorola ([www.motorola.com](http://www.motorola.com)).

# find your software tester future

## **software tester**

"We have the difficult job of telling a software developer that his or her baby is ugly." That's how one software tester described this career. The job of the tester is to be critical of software, making sure it is easy to use and does what it's supposed to do without irritating glitches or bugs. Software testers' work makes software the best it can be. While the testers will praise things that work well, they will also send back software to the developers with recommendations on how it can be better.

Naturally, software testers work very closely with developers, and most development companies have at least one tester on staff. By working closely together, testers can make sure developers can catch problems early on and avoid spending too much time and money creating a faulty product. Even after a tester's corrections have been made, the software must go back to the tester who can verify that everything is working correctly.

Testers usually begin their work by reading product specifications from a technical document so they know exactly what the product is

## **Get Started Now!**

**Are you more a critic than a creator? Then consider the world of software testing. Here's how to start:**

- There are free software-testing tutorials on-line. For example, check [www.empirix.com](http://www.empirix.com).
- Increase your familiarity with computers and how software is constructed. Take note of the software you use and how it operates. Push yourself to learn new aspects of the software you already own.
- Courses in computer programming can really help, since software is put together using programming languages.
- Read through computer magazines, paying attention to problems users are having with software.

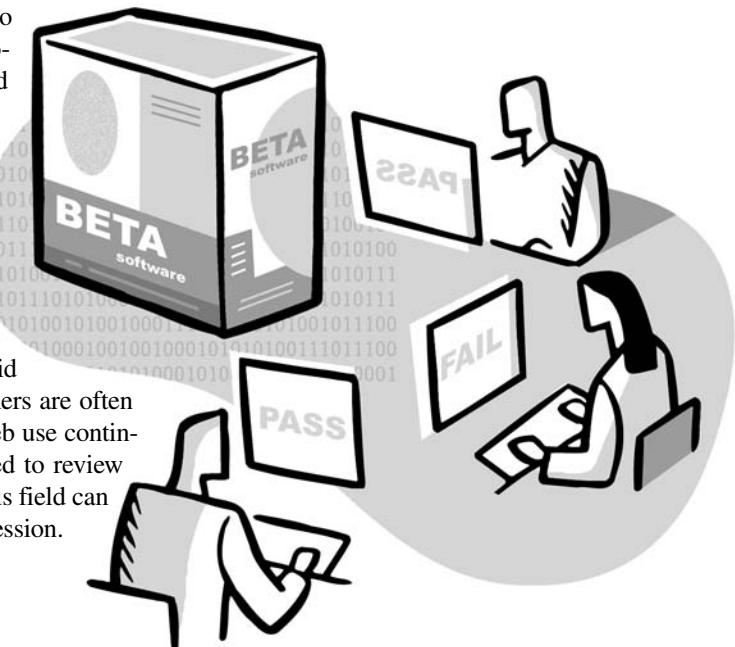
## Hire Yourself!

Test your own software. Choose two or three software programs that you use regularly. Make a chart with three columns. In the first column, label and describe the software program and its basic function (e.g., word processing or spreadsheet). In the second column, list the features you find most useful (your “likes”). In the third column, list the features you find cumbersome and confusing (your “dislikes”). Use a highlighter to indicate the software that you think best accomplishes the tasks it was designed for. By honing your critical skills, you can begin to train yourself to be a software tester.

designed to do. Some of the tests involve the graphical user interface or GUI (pronounced *gooey*), making sure what the user clicks on the screen operates correctly, looks good, and makes sense. Installation tests are carried out so that applications that are installed won’t cause computers to crash.

Over time, testers develop protocol or effective strategies to test each module that composes the software. They keep careful notes on all defects and progress. Detail-oriented people really shine at this job because manufacturers want testers who will thoroughly examine all the components of a software package. Verbal and written skills are also highly valued since testers must explain their results in a clear and concise manner. Software developers often want quick turnaround, so testers have to handle deadline pressure well.

From accounting to education to games and more, software covers a wide range of applications. If you are an avid gamer, you will be glad to know that gamers are often in demand to test computer games. As Web use continues to expand, more testers will be needed to review applicable software. Those interested in this field can feel assured that this is an expanding profession.





#### **Search It!**

Institute of Electrical and Electronics Engineers at [www.ieee.org](http://www.ieee.org) and Association of Information Technology Professionals at [www.aitp.org](http://www.aitp.org)



#### **Read It!**

Computerworld at [www.computerworld.com](http://www.computerworld.com)



#### **Learn It!**

- A bachelor's degree in computer science, information systems, or computer engineering
- Fluency in programming languages such as C, Visual Basic, and Java



#### **Earn It!**

Average annual salary is \$58,942.  
(Source: Computerworld)



#### **Find It!**

Peruse current job opportunities at SystemAnalyst.com ([www.systemanalyst.com](http://www.systemanalyst.com)).

# find systems analyst future

## **systems analyst**

In the computer jobs pyramid, systems analysts (sometimes called SAs) are often near the top. They look at the big picture when it comes to a company's computer operations. They have to know all the details of how a computer system is meeting the demands of a company. They handle equipment and technology (programming is second nature), planning, managing a staff, communicating with corporate leaders, and budgeting.

A systems analyst at an on-line travel service, for instance, makes sure the user at home on his computer is happy with the interface—that he can easily understand how to buy airplane tickets and get information about when and where they're flying and give credit card details. The SA assures that data is smoothly captured, processed, and stored. Then information regarding tickets and flights must flow back to the user in a clear and timely manner.

## **Get Started Now!**

**As with preparing for most IT careers, you need to build your math and computer knowledge.**

- Take as many advanced math, science, and computer courses as you can—especially advanced placement (AP) courses that can earn college credit. Check into summer programs that focus on computer technology.
- Learn as much about computer programming as you can. See our profile of Computer Programmer.
- Puzzle solving and problem solving are essential, so stay sharp with puzzle and game books.
- Get involved in group activities and clubs and try to take on responsibilities. Leadership and communication skills are vital to this career—belonging to a club is a great way to build these skills.

## Hire Yourself!

**B**ecause systems analysis involves integrating several components into a complete system, you decide to hire yourself out as a PC systems analyst who specializes in maximizing the efficiency of home computer systems. To start, carefully look at your own home system and write down ways you might upgrade your setup. Do you have all the software you need to take care of your work? Do you have enough memory in your machine? Is your printer adequate for your needs? Do you need any peripherals to help you with your work—for example, a CD burner or a ZIP drive to save information? Create a spreadsheet to record this data and compare it with what you consider to be the ideal components of a home computer system.

As the job title implies, this career requires a lot of analyzing or problem solving. In many ways, these problem-solvers are the computer gurus who listen carefully to corporate management and determine the computer solutions that are needed to improve operations. The answers depend on how much staff, equipment, and money they have to complete the job. SAs may give budget estimates and set a timeframe to complete a project. Based on these details, SAs figure out how to build computer systems (software, hardware, networks) to perform necessary tasks or modify existing systems. Sometimes a problem can be solved with one simple new software application; other times entire computer systems need to be installed.

Coming up with the right solutions means doing the homework—conducting studies about what type of programs, software, and hardware will meet current and projected needs. As research is completed, technical reports, memoranda, instructional manuals, and documentation of program development are written. Eventually, flow charts and diagrams may be created to detail how operations are to be performed. What will be the sequence of processing? How will output look for the user? Basically, reams of documentation are required to describe how the system will be programmed and operate. After a new system is developed, the analyst often tests the system and works out any bugs.

This is very much a people-oriented job. SAs aim to please managers and users, while turning to various technical specialists to implement computer applications. They rely on programmers, database managers, and technicians to get systems up and running and keep them running.



Keeping workers on task takes an acute awareness of organizational behaviors and office politics.

Because there are so many types of networks, applications, and hardware, systems analyst roles vary—some focus on software design, others may strictly work on network development. Kenneth Lau, of CGO Group Canada Ltd., says, “As a systems analyst, I try to figure out ways to allow the work flow to become easier by designing programs to let employees process their work faster, smoother, and waste no time.”

In a smaller organization, the analyst may also be the sole programmer and rely heavily on computer-assisted software engineering (CASE) tools. At bigger companies, the analysts are the chief information officers, high up in the ranks of a company.

Being in charge can mean lots of responsibility and stress, often working long hours to meet project deadlines. No matter what level the position, all analysts have to keep learning as technology advances in order to improve business systems.

# find technical your writer future

**technical writer** When someone is lost, are you good at giving directions? On the other hand, are you just as good at understanding directions when it comes to completing an assignment or setting up stereo or computer equipment? If so, technical writing may be the field for you because so much of the work involves writing directions—taking complex scientific or technical information and translating it so a nontechnical audience can understand.

The guide to use a new software package, the installation manual for a computer, and training materials for a Web course are all produced by technical writers. Beyond writing instructional materials, these professionals also create speeches, press releases, presentations, proposals,

## Get Started Now!

**If you like the idea of combining the worlds of words and technology, you can start to prep yourself for this career.**

- Check out discussion forums for tech writers on the Web. Read tech journals and get familiar with the terms.
- Follow directions and set up computer equipment on your own—install software, network your computer with others, etc. Pay close attention to whether or not the directions are helpful, and why or why not.
- Learn some basic programming, including HTML and Javascript.
- See if your local community college offers a course in tech writing. The Society for Technical Communication provides exercises for students that help hone tech-writing skills ([www.stc.org](http://www.stc.org)).



### Search It!

Society for Technical Communication (STC) at [www.stc.org](http://www.stc.org)



### Read It!

Klariti.com at [www.klariti.com](http://www.klariti.com)  
and Techwr-L at [www.raycomm.com/techwhirl](http://www.raycomm.com/techwhirl)



### Learn It!

- A bachelor's degree is recommended, but there is no set educational path
- Many schools offer degrees in technical communication. For a thorough list, check the academic programs database on the STC website at [www.stc.org](http://www.stc.org)



### Earn It!

Median annual salary is \$61,730.  
(Source: Society for Technical Communication salary survey)



### Find It!

Potential employers include Microsoft ([www.microsoft.com](http://www.microsoft.com)), NASA ([www.nasa.gov](http://www.nasa.gov)), and Toshiba ([www.toshiba.com](http://www.toshiba.com)).

## Hire Yourself!

One day you'll leave your home and move into a new pad, whether it is a dorm, an apartment, or a house. What if you couldn't be there when your stuff arrives at your new home, but you'd like to get someone to set it up? To prepare ahead, write down directions on how to set up one of your major electronic systems, such as the computer or stereo. These directions can help someone else set up your gear, or they may even be of help to you—sometimes it's hard to remember how things fit together, especially if you don't have the original instructions.

technical reports, advertisements, and pamphlets. The projects can range from one page long to several thousand.

Those who thrive in the field not only have a passion for new technology, they also are strong communicators. Often people who pursue this occupation have studied English and computer science. They know how things work and how to write. In addition to writing, the job can involve some desktop publishing skills as well—assisting with photographs, illustrations, charts, and layouts. Sometimes their role is strictly reviewing the writing of others and recommending revisions or changes in content or format.

In most cases, tech writers complete assignments following strict guidelines regarding style and presentation. They often meet with engineers, software developers, and others who have created a product so they can fully understand the technical material. Some writers estimate that their job is really 70 percent research and 30 percent writing. Only by spending time with a product, using it extensively, and taking notes on its operation, are they able to properly explain how it works.

Because they are often good at figuring out step-by-step approaches, tech writers will develop procedures for equipment operation, assembly, and manufacturing. Tech writers keep up with technological advances, reading all the latest journals and magazines to stay on top of product technologies and production methods.



The educational path to technical writing is varied. According to the Society for Technical Communication (STC), 32 percent of its members hold degrees in English; 22 percent in technical communications; 10 percent in business administration; 9 percent in computer science; 9 percent in science; 8 percent in engineering; and 7 percent in journalism. The common denominators are an ability to think clearly and communicate effectively.

Technical writing is a growing profession—membership in STC has risen 30 percent in the past 10 years. As more industries turn to technical writers, more professionals specialize in areas such as medical technology, aeronautics, agriculture, pharmaceuticals, and telecommunications. You could be writing a manual on how to fly a fighter jet or helping a surgeon prepare a research paper for publication. Still, no matter what the industry, those who have the knack for taking technical information and presenting it clearly are in demand.



#### **Search It!**

United States Telecom Association at [www.usta.org](http://www.usta.org) and Communications Workers of America at [www.cwa-union.org](http://www.cwa-union.org)



#### **Read It!**

Telecommunications Magazine at [www.telecommagazine.com](http://www.telecommagazine.com)



#### **Learn It!**

- A minimum of a bachelor's degree in electrical engineering, computer science, or computer engineering
- Some colleges and universities award master's degrees in telecommunications engineering



#### **Earn It!**

Median annual salary is \$68,000.  
(Source: U.S. Department of Labor)



#### **Find It!**

Many businesses hire telecommunications engineers, but a good place to explore opportunities is with the top communications companies—Verizon ([www.verizon.com](http://www.verizon.com)), AT&T ([www.att.com](http://www.att.com)), and T-Mobile ([www.t-mobile.com](http://www.t-mobile.com)).

# **find telecommunications your engineer future**

## **telecommunications engineer**

The science of communicating at a distance, or telecommunications, has a long history. The earliest telecommunications may have been the use of smoke signals and beating drums. As technology advanced, scientists discovered how to communicate by electronic transmission of impulses—through telegraph, cable, telephone, radio, and television. Now a single optical fiber, as thick as a human hair, can potentially carry half a million digital television channels.

Telecommunications engineers are the ones who are responsible for planning, designing, monitoring, and managing today's complex telecommunications systems. Just about anywhere you find electronic communication and information technology, you will find the work of these engineers—from computer networks to cable television to satellite transmissions to mobile and wireless phones to the Internet.

## **Get Started Now!**

**Get plugged into the world of telecommunications with a few first steps.**

- Take advanced math, science, and computer courses, especially advanced placement (AP) courses. Look into summer programs that teach computer science with an emphasis on communications.
- Many hobby shops carry kits that let kids build basic telecommunications devices from radios to telegraph machines. Check out [www.projectkitsforkids.com](http://www.projectkitsforkids.com).
- Participation in after-school clubs can help build leadership and communication skills essential to this career.

## Hire Yourself!

The top telecommunications firms are looking for innovative ways to transmit information. Sometimes new technological ideas come from thinking “outside the box.” In order to get some new creative ideas, a major communications company wants you to think of three new ways to communicate with other students in your class without talking directly to each other. These methods can be as crazy, wacky, or as far-fetched as you want—projecting words on a wall, whispering through rubber hoses that reach each desk, clapping out letters via a Morse code-like system. Describe and illustrate each idea on a separate sheet of paper or on a separate slide of a PowerPoint presentation.

The technology is so diverse and growing so rapidly that a telecommunications engineer may specialize in any number of areas. They may invent a new mobile camera phone, install a voice and electronic mail network, or supervise an engineering team working on a precision satellite system (such as GPS—the Global Positioning System that is installed in many cars to offer driving directions via satellite). Recent scientific advances have led to some exciting career opportunities. Some engineers design and plan communication systems using fiber optic cables, which transmit light signals along glass strands. The cables rely on the science of wavelength division multiplexing (WDM), a method of carrying information through different colors of the spectrum. These cables can transmit more signals much faster than the traditional copper wires.

Telephone communication is still the biggest specialty in this field, including the widespread use of wireless systems. Those who concentrate in this area are often experts in switches and routers, electronic equipment that guides communication signals to their ultimate destination. Wireless professionals understand how cell phones transmit radio signals to radio towers and how the signal is then carried along the wireless network. You can thank telecommunications engineers for new devices that let us use our cell phones to take photos and connect to the Internet.

Engineers are often educators, working closely with clients to explain how systems meet their needs, or with technicians and customer service staff to explain equipment. They are also perpetual students, constantly learning the latest advances. Opportunities and earnings in this field are expected to rise rapidly as telecommunications continues to grow at seemingly lightning speed.



#### **Search It!**

Usability Professionals Association  
at [www.upassoc.org](http://www.upassoc.org)



#### **Read It!**

User Experience Magazine at  
[www.upassoc.org/upa\\_publications/user\\_experience/index.html](http://www.upassoc.org/upa_publications/user_experience/index.html) or articles at  
<http://Useit.com>



#### **Learn It!**

At least a bachelor's degree in computer science, human factors engineering, information science, organizational psychology, or human-computer interaction.



#### **Earn It!**

Average annual salary is \$71,000.  
(Source: Human Factors and Ergonomics Society)



#### **Find It!**

Employers include Microsoft ([www.microsoft.com](http://www.microsoft.com)), Lockheed Martin ([www.lockheedmartin.com](http://www.lockheedmartin.com)), and Dupont ([www.dupont.com](http://www.dupont.com)).

**find your usability specialist future**

## **usability specialist**

Have you ever been frustrated by using an electronic device or visiting a website that was impossible to figure out? In today's modern tech-speak, you would say they had bad "usability." It is the job of the usability specialist to make websites, software, mobile technology, electronic devices, and other equipment simple to use. These experts study how humans interact with a product or system, and then they recommend how the product or system should be constructed or improved upon to make the user's experience better. Basically, these professionals want your life to be easier.

This new and developing field is unique in that it combines technology and psychology. These specialists study human behavior to determine exactly how people use technology—what makes it easy for them and what makes it hard. To get accurate data, they observe a number of users and how they interact with the product. They pay close attention to any patterns in use and the time it takes to perform functions. They use videotape and machines that track eye movements to help them perform detailed analysis. Usability specialists may also ask people to

## **Get Started Now!**

**Want to make the world of technology a better place to live in? Start honing your usability sensibility.**

- Look at websites and other products with a critical eye.  
Why are they designed the way they are, and do they meet the goals of the business?
- Classes in Web design can help you understand what goes into making a user-friendly site.
- Marketing and psychology courses may prove helpful in understanding how people respond to different products. Try to take some of these courses early on in your educational pursuits.

## Hire Yourself!

The IT world needs usability specialists. To search for future specialists, a major software manufacturer has asked students to submit a plan on how they would make their bedroom or dorm more efficient. Write down and sketch how you can make your room more practical, so you can get things done faster. For example, are there ways to organize your clothes to dress faster? Are there ways to arrange your workspace to work faster? Think effective, efficient, and easy to use.

answer questions about products and give their thoughts about how they interacted with the technology.

Overall, these specialists are concerned with how fast people can learn to use a technology, how efficiently they can get things done, how memorable the system is, and how often they make mistakes. Perhaps the most important question they ask a subject is, “Did you enjoy using the product?”

These experts review the data and quantify the number of times mistakes were made or difficulties encountered. Based on statistical data and statements from users, specialists write reports and recommend improvements to software specialists and designers. Usability is a challenging field to enter because it requires various skills, from statistics to communication to research. Those with an investigative mind do especially well in this job because it demands a close analysis of details and following procedures in order to find solutions.

Naturally, many technology companies are interested in advice from usability experts because, simply put, products that are easy to use are going to sell much better than ones that cause frustration. Those doing business on the Web are particularly concerned with usability because if visitors find the site confusing, they will click away and probably never return. Sometimes to test usability, a specialist designs a task sheet that requires the user to perform specific tasks on the website being tested. Can the user easily navigate through and find the information she needs? Is it easy to give personal information, such as a credit card number? In this competitive market, it's no wonder usability experts are in such hot demand.





#### **Search It!**

International Webmasters Association at [www.iwanet.org](http://www.iwanet.org), Web Professional Research Center at [www.cio.com/careers/index.html](http://www.cio.com/careers/index.html), and The World Organization of Webmasters at [www.joinwow.org](http://www.joinwow.org).



#### **Read It!**

Webmaster Magazine at [www.webmastermagazine.com](http://www.webmastermagazine.com)



#### **Learn It!**

Two to four-year degree in Web, graphic, or multimedia design.



#### **Earn It!**

Average annual starting salary is \$53,000. Experienced Webmasters make up to \$100,000.  
(Source: *ComputerWorld* survey)



#### **Find It!**

Investigate companies that do a lot of business on the Web, such as Amazon ([www.amazon.com](http://www.amazon.com)), eBay ([www.ebay.com](http://www.ebay.com)), and the stock brokerage house Charles Schwab ([www.schwab.com](http://www.schwab.com)).

# find your webmaster future

## **webmaster**

When you hear the job title Webmaster, you may picture a meditating guru with legs crossed who has mastered all the secrets of the World Wide Web. In many ways, that image is right on, and, in fact, Webmasters are sometimes referred to as gurus because they have complete knowledge of this domain—how to build a website's framework, handle its programming, design its look, provide its content, and maintain it over time.

The fact is, however, that many Webmasters were not interested in computers at all when they started out. They learned bit by bit over time, and many were motivated by the content rather than the technology. Content is still the driving force behind a website. Ultimately, that's why people visit a site—whether it is for a laugh ([www.theonion.com](http://www.theonion.com)), or political articles ([www.slate.com](http://www.slate.com)), or to see short movies ([www.atomfilms.com](http://www.atomfilms.com)). Think of a topic and there's probably a site for it on the Internet, and you can find it easily on a search engine like [www.google.com](http://www.google.com).

## **Get Started Now!**

**Mastering all things Web-related does take time, but here are some ideas on getting started.**

- See what goes into making a great website. Check out the winners of the Webby awards ([www.webbyawards.com](http://www.webbyawards.com)). Write down the different features you like about each site. For instance, maybe it's easy to navigate, or the graphics grab your attention. Also, jot down what you don't like about a site.
- You'll need to speak the language of the Internet to pursue a career in this field. Webopedia ([www.webopedia.com](http://www.webopedia.com)), an on-line dictionary of computer and Internet terms, is a great place to start.

## Hire Yourself!

**W**hat does it take to create a great website? Take a look at some of the best and find out. First visit World Best Websites at [www.worldbestwebsites.com](http://www.worldbestwebsites.com), the Webby Awards at [www.webbyawards.com](http://www.webbyawards.com), and some of your own favorites. Browse, peruse, compare, contrast, and come up with a list of 10 features common to especially good websites.

Starting out strictly as a means of sharing knowledge, the Web really caught on with the public in the early 1990s and rapidly expanded as a means to sell products and services. Now businesses, nonprofits, Web design companies, and government agencies all employ Webmasters to help them communicate, educate, entertain, sell, and collect data. Beyond knowing the content that will go into a site, a Webmaster knows how to house the content, building the framework that will hold it. Code, specifically HTML or hypertext markup language, is at the foundation of all websites. In general, Webmasters are fluent code-writers, but programs such as Dreamweaver and Microsoft Frontpage have made life easier. With these programs, you basically cut and paste words and images to build a site, and then the programs write the code for you. Other popular programming languages are Java (a high-level programming language developed by Sun Microsystems that is well-suited for Web work) and Perl (Practical Extraction and Report Language, which is popular for writing CGI scripts—explained below).

Good sites are set up so visitors can navigate easily to the information they seek, and content comes up quickly for the viewer. Often a search engine is provided within the site to aide the visitor.

Along with establishing the overall structure of a site, Webmasters make them visually exciting using fonts, photos, and other graphics. This is a visual medium—so an art design sense is vital, as well as knowledge of basic computer graphic software, such as Photoshop and Quark. To add in sound, a program like RealAudio might be used, and to animate characters or type, professionals often rely on a program called Flash. Drawing on all these tools, Webmasters build sites that are attractive and entertaining places to visit.

For any site to be useful, it must be seen. To drive traffic their way, Webmasters employ methods to make the site appear more often on search engines: they link their site with other sites and mount marketing and advertising campaigns. To monitor a site's popularity, the Webmaster keeps a count of “hits” or visits.

To sell on the Web, a Common Gateway Interface (CGI) is often used—this is any program that accepts and returns data to the user. If you've bought CDs on-line, you probably used a CGI (often written in Perl). It lets you submit your name, address, and credit card information, and then the CD company can send out an automatic confirmation of your order and a thank-you.

When the whole site is complete, it must then be housed and maintained on a computer server or host where visitors can access it 24 hours a day. Also, note that some Webmasters manage a company's intranet, a system to share information in-house. Typically, these networks are accessible only by a company's employees, members, and those with authorized access.

A Webmaster can't always perform all these tasks alone. They often manage a staff, including Web technicians who change and add content, website administrators who install, maintain, and troubleshoot hardware and software, Web designers who create the look of a site, and marketing and advertising experts. Webmasters also meet with company heads to make sure the website is fulfilling goals and projects are being completed within budget.

The great news for Webmasters is that more and more companies are setting up websites and expanding their uses, so opportunities should continue to multiply in the years to come.



# find your wireless engineer future

## wireless engineer

From cell phones to networks that allow on-line access across the airwaves, wireless technology is everywhere and ever expanding. People around the world are communicating with Palm Pilots, pocket PCs, pagers, cell phones, Blackberries (multifunctional devices that are a combination of cell phone and pocket PC), and more. It may seem like a new field, but wireless technology goes back to the early days of radio. In fact, the radio was originally called the wireless, and the process of transmitting signals through the air is the foundation for all of today's modern wireless engineering.

### Get Started Now!

**Want to help keep the world connected? Here are some first steps toward a career in wireless engineering.**

- Go to the hobby shop and buy yourself a simple radio-building kit. Getting a grasp on how a radio works will set the stage for understanding more advanced wireless concepts.
- An internship or co-op experience can give you an edge if pursuing a career in wireless.
- Wireless companies want to attract new talent to the field, so a few are developing curricula for the schools. Talk to your science and math teachers about introducing such curricula as part of the lesson plans. For example, Texas Instruments has developed the Infinity Project, an engineering curriculum that high school math teachers can adopt for their classes.
- Read up on the technology. Try *The Cellular Connection: A Guide to Cellular Phones*, by Robert Steuernagel (Wiley-Interscience, 2000) and *Wireless Crash Course*, by Paul Bedell (McGraw-Hill Professional, 2001).

**explore your options**



#### Search It!

Wireless Engineer at [www.wirelessengineer.com](http://www.wirelessengineer.com), Wireless Developer Network at [www.wirelessdevnet.com](http://www.wirelessdevnet.com), and Wireless LAN Association at [www.wlana.org](http://www.wlana.org)



#### Read It!

Wireless Systems Design at [www.wsdmag.com](http://www.wsdmag.com)



#### Learn It!

- A master's degree in electrical engineering
- Wireless LAN Association lists training programs at [www.wlana.org](http://www.wlana.org)



#### Earn It!

Average annual salary is \$80,000.  
(Source: *SmartMoney* magazine)



#### Find It!

Leading firms in wireless development include Bluetooth ([www.bluetooth.com](http://www.bluetooth.com)), Texas Instruments ([www.ti.com](http://www.ti.com)), Ericsson ([www.ericsson.com](http://www.ericsson.com)), and Global Wireless Solutions ([www.gwsolutions.com](http://www.gwsolutions.com)).

## Hire Yourself!

**F**or a company offering cell phone service to succeed, it needs to be able to provide good coverage to its users. A new cell phone company wants you to be its “Can You Hear Me Now” person. Go around the school and your neighborhood with a cell phone and report on the clarity of the transmission at various locations. Rate the strength of the signal on a scale of 1 to 10 and report back on what areas have a poor receiving signal. Tell why you think certain areas might have a poor signal. With your results, the new company can work on providing a stronger signal to certain areas.

Today’s wireless engineers work for organizations like phone companies and other organizations, figuring out their communication systems and determining their wireless requirements and then implementing, configuring, and maintaining the wireless plan. In the cell phone business, engineers help build and maintain communication networks. Cell phones are really just sophisticated radios that communicate through base towers, each located in a small division of a city called a cell, which measures about 10 square miles. Engineers design the systems that allow a cell call to be transmitted to a base station and then assigned to an available radio frequency channel. The call’s voice signal is then sent to a switching center, where the call is transferred to its destination.

Wireless specialists also design and manage an organization’s wireless infrastructure. This includes choosing the wireless hardware and systems, securing those systems so only those authorized can use it, and keeping systems flexible for users. A wireless local-area network (WLAN) typically spans a relatively small area confined to a single building or a group of buildings. (Not all LANs are wireless, but all LANs connect workstations or personal computers with a main computer that holds all of a company’s vital data and operations.)

To establish the wireless LAN, the engineer may meet with a customer to discuss and document specific requirements, including application and bandwidth needed for the system. The engineer analyzes the site conditions to determine the appropriate equipment for the coverage and the desired functions.

Wireless systems depend on technology known as WiFi, or wireless fidelity. Users need an access point and a network interface card or wireless card. The access point is mounted on the wall and hardwired to the local area network. The access point has a transmitter that beams

radio waves. Properly equipped devices receive and send signals to the access point.

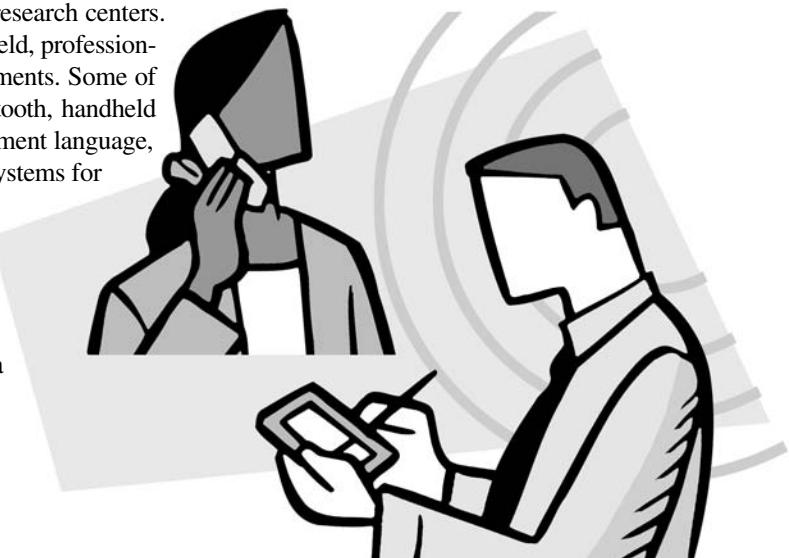
This type of wireless LAN (WLAN) can be valuable for a business's internal operations and the uses vary widely. Some hospitals use portable computers to access medical data over the airwaves without connecting to a wall outlet or jack. At one mining firm, the WLAN transmits real-time information from bulldozers back to the main office where supervisors monitor progress. At a shipping yard in Seattle, dock workers punch in with a card they swipe at wired PC terminals, and supervisors then use their wireless PDAs (personal digital assistants) to see at a glance the number of workers in the yard and assign them to a task. At the Prada flagship store in New York, clothes have RFID (radio frequency identification) tags. Customers take the clothes in the dressing rooms featuring plasma screens. The screens are equipped to read tags and display information on the designer and choices of fabric and color.

More and more public spaces are being outfitted with WiFi networks as well. They let laptop users connect to the Internet without plugging in but instead using a wireless card. Airports, parks, cafes, and fast food restaurants (including Starbucks, Friendly's, and McDonald's) are all offering the WiFi connection. Students can do research in college cafeterias, and commuters on one California train line can even check e-mail.

As this career continues to boom, a number of universities are developing undergraduate wireless engineering majors. Wireless specialty courses and certificate programs are also popping up at vocational schools and university extension programs. Some advanced degree programs are offered at campuses hosting wireless research centers.

Because this is a rapidly evolving field, professionals have to keep up with new developments. Some of the modern technology includes Bluetooth, handheld device markup language, data management language, short messaging service, and Global Systems for Mobile Communications.

Research by several industry associations predicts that by the year 2010, the industry will need up to 300,000 technicians and engineers in this field. Wireless engineering is a hot career!



# Big Question #5: ? do you have the right skills?

**C**areer exploration is, in one sense, career matchmaking. The goal is to match your basic traits, interests and strengths, work values, and work personality with viable career options.

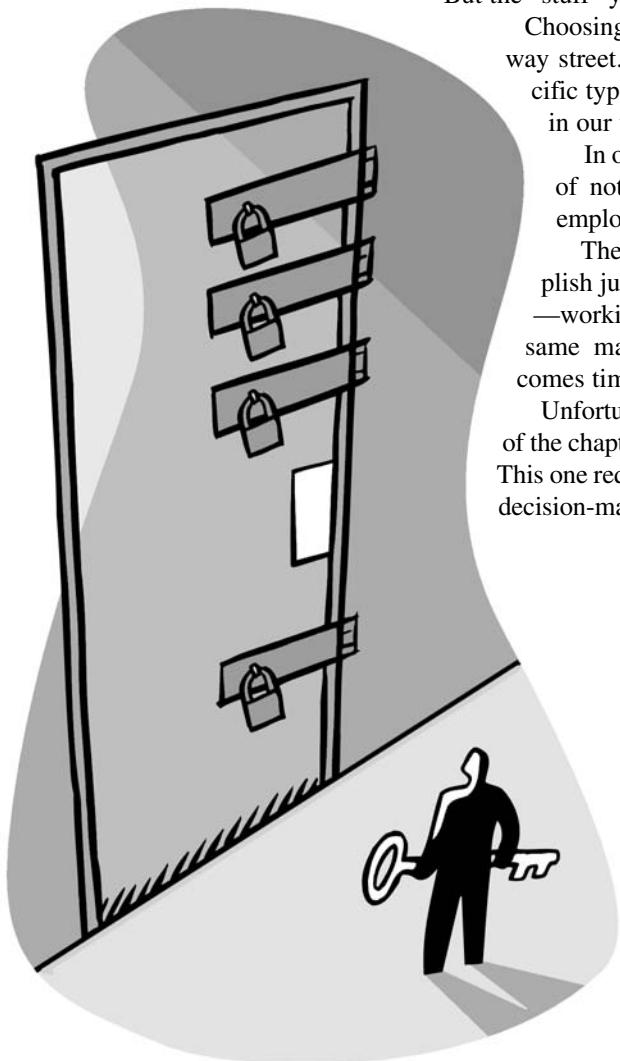
But the “stuff” you bring to a job is only half of the story.

Choosing an ideal job and landing your dream job is a two-way street. Potential employers look for candidates with specific types of skills and backgrounds. This is especially true in our technology-infused, global economy.

In order to find the perfect fit, you need to be fully aware of not only what you’ve got but also what prospective employers need.

The following activity is designed to help you accomplish just that. This time we’ll use the “wannabe” approach—working with careers you think you want to consider. This same matchmaking process will come in handy when it comes time for the real thing too.

Unfortunately, this isn’t one of those “please turn to the end of the chapter and you’ll find all the answers” types of activities. This one requires the best critical thinking, problem-solving, and decision-making skills you can muster.





Big Activity #5:

## do you have the right skills?

### Here's how it works:

**Step 1:** First, make a chart like the one on page 126.

**Step 2:** Next, pick a career profile that interests you and use the following resources to compile a list of the traits and skills needed to be successful. Include:

- Information featured in the career profile in this book;
- Information you discover when you look through websites of any of the professional associations or other resources listed with each career profile;
- Information from the career profiles and skills lists found on-line at America's Career InfoNet at [www.acinet.org](http://www.acinet.org).

Briefly list the traits or skills you find on separate lines in the first column of your chart.

**Step 3:** Evaluate yourself as honestly as possible. If, after careful consideration, you conclude that you already possess one of the traits or skills included on your list, place an *X* in the column marked "Got It!" If you conclude that the skill or trait is one you've yet to acquire, follow these directions to complete the column marked "Get It!":

- If you believe that gaining proficiency in a skill is just a matter of time and experience and you're willing to do whatever it takes to acquire that skill, place a *Y* (for yes) in the corresponding space.
- Or, if you are quite certain that a particular skill is one that you don't possess now, and either can't or won't do what it takes to acquire it, mark the corresponding space with an *N* (for no). For example, you want to be a brain surgeon. It's important, prestigious work and the pay is good. But, truth be told, you'd rather have brain surgery yourself than sit through eight more years of really intense science and math. This rather significant factor may or may not affect your ultimate career choice. But it's better to think it through now rather than six years into med school.

**Step 4:** Place your completed chart in your Big Question AnswerBook.

When you work through this process carefully, you should get some eye-opening insights into the kinds of careers that are right for you. Half reality check and half wake-up call, this activity lets you see how you measure up against important workforce competencies.

Big Activity #5: **do you have the right skills?**

# **more career ideas in information technology**

**C**areers featured in the previous section represent mainstream, highly viable occupations where someone with the right set of skills and training stands more than half a chance of finding gainful employment. However, these ideas are just the beginning. There are lots of ways to make a living in any industry—and this one is no exception.

Following is a list of career ideas related in one way or another to information technology. This list is included here for two reasons. First, to illustrate some unique ways to blend your interests with real-world opportunities. Second, to keep you thinking beyond the obvious.

As you peruse the list you’re sure to encounter some occupations you’ve never heard of before. Good. We hope you get curious enough to look them up. Others may trigger one of those “aha” moments where everything clicks and you know you’re onto something good. Either way we hope it helps point the way toward some rewarding high-tech opportunities.

Application Security Analyst

Application Support Specialist

Business Systems Analyst

Chief Technology Officer (CTO)

Computer Cartographer

Computer Consultant

Computer Customer Care Representative

Computer Game Tester

Computer Hardware Manufacturing Technician

Computer Industry Analyst

Computer Product Sales Representative

Computer Retail Store Clerk  
Computer Retail Store Manager  
Computer Science Professor  
Computer System Designer  
Computer-Aided Manufacturing (CAM) Technician  
Database Analyst  
Database Manager  
Documentation Specialist  
Electronic Data Processing Auditor  
Electronic Sound Producer  
Engineering Programmer  
Help Desk Specialist  
Information Systems Communication Administrator  
Information Systems Director  
Information Systems Manager

Internet Advertisement Designer  
Internet Application Programmer  
Internet Security Specialist  
Internet Service Provider  
Network Administrator  
Network Control Operator  
Network Engineer  
On-line Researcher  
Operations Research Analyst  
Project Manager  
Quality Assurance Manager  
Robotics Engineer  
Robotics Technician  
Scientific Programmer  
Software Engineer  
Software Entrepreneur

Software Product Manager  
Software Tester  
Special Effects Programmer  
Statistician  
Storage System Engineer  
Systems Integrator  
Technical Editor  
Technical Support Manager  
Technical Support Representative  
Telecommunications Technician  
Trainer  
Training Manager  
Typesetter  
User Interface Designer  
Virtual Reality Programmer  
Web Application Developer  
Word Processor

# Big Question #6: ? are you on the right path?

You've covered a lot of ground so far. You've had a chance to discover more about your own potential and expectations. You've taken some time to explore the realities of a wide variety of career opportunities within this industry.

Now is a good time to sort through all the details and figure out what all this means to you. This process involves equal measures of input from your head and your heart. Be honest, think big, and, most of all, stay true to you.

You may be considering an occupation that requires years of advanced schooling which, from your point of view, seems an insurmountable hurdle. What do you do? Give up before you even get started? We hope not. We'd suggest that you try some creative thinking.





Big Activity #6:

## **are you on the right path?**

Start by asking yourself if you want to pursue this particular career so badly that you're willing to do whatever it takes to make it. Then stretch your thinking a little to consider alternative routes, nontraditional career paths, and other equally meaningful occupations.

Following are some prompts to help you sort through your ideas. Simply jot down each prompt on a separate sheet of notebook paper and leave plenty of space for your responses.

## Big Activity #6: **are you on the right path?**

One thing I know for sure about my future occupation is

I'd prefer to pursue a career that offers

I'd prefer to pursue a career that requires

A career option I'm now considering is

What appeals to me most about this career is

What concerns me most about this career is

Things that I still need to learn about this career include

## Big Activity #6: **are you on the right path?**

Another career option I'm considering is

What appeals to me most about this career is

What concerns me most about this career is

Things that I still need to learn about this career include

Of these two career options I've named, the one that best fits most of my interests, skills, values, and work personality is because

### **At this point in the process, I am**

- Pretty sure I'm on the right track
- Not quite sure yet but still interested in exploring some more
- Completely clueless about what I want to do

# SECTION 3

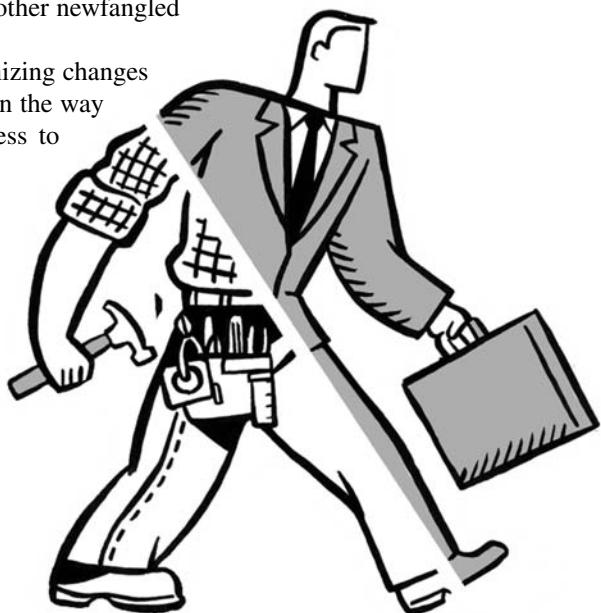
# experiment with success

**R**ight about now you may find it encouraging to learn that the average person changes careers five to seven times in his or her life. Plus, most college students change majors several times. Even people who are totally set on what they want to do often end up being happier doing something just a little bit different from what they first imagined.

So, whether you think you've found the ultimate answer to career happiness or you're just as confused as ever, you're in good company. The best advice for navigating these important life choices is this: Always keep the door open to new ideas.

As smart and dedicated as you may be, you just can't predict the future. Some of the most successful professionals in any imaginable field could never ever have predicted what—and how—they would be doing what they actually do today. Why? Because when they were in high school those jobs didn't even exist. It was not too long ago that there were no such things as personal computers, Internet research, digital cameras, mass e-mails, cell phones, or any of the other newfangled tools that are so critical to so many jobs today.

Keeping the door open means being open to recognizing changes in yourself as you mature and being open to changes in the way the world works. It also involves a certain willingness to learn new things and tackle new challenges.



It's easy to see how being open to change can sometimes allow you to go further in your chosen career than you ever dreamed. For instance, in almost any profession you can imagine, technology has fueled unprecedented opportunities. Those people and companies who have embraced this "new way of working" have often surpassed their original expectations of success. Just ask Bill Gates. He's now one of the world's wealthiest men thanks to a company called Microsoft that he cofounded while still a student at Harvard University.

It's a little harder to see, but being open to change can also mean that you may have to let go of your first dream and find a more appropriate one. Maybe your dream is to become a professional athlete. At this point in your life you may think that there's nothing in the world that would possibly make you happier. Maybe you're right and maybe you have the talent and persistence (and the lucky breaks) to take you all the way.

But maybe you don't. Perhaps if you opened yourself to new ideas you'd discover that the best career involves blending your interest in sports with your talent in writing to become a sports journalist or sports information director. Maybe your love of a particular sport and your interest in working with children might best be served in a coaching career. Who knows what you might achieve when you open yourself to all the possibilities?

So, whether you've settled on a career direction or you are still not sure where you want to go, there are several "next steps" to consider. In this section, you'll find three more Big Questions to help keep your career planning moving forward. These Big Questions are:

- Big Question #7: **who knows what you need to know?**
- Big Question #8: **how can you find out what a career is really like?**
- Big Question #9: **how do you know when you've made the right choice?**

## **? Big Question #7: who knows what you need to know?**

**W**hen it comes to the nitty-gritty details about what a particular job is really like, who knows what you need to know? Someone with a job like the one you want, of course. They'll have the inside scoop—important information you may never find in books or websites. So make talking to as many people as you can part of your career planning process.

Learn from them how they turned their own challenges into opportunities, how they got started, and how they made it to where they are now. Ask the questions that aren't covered in "official" resources, such as what it is really like to do their job, how they manage to do a good job and have a great life, how they learned what they needed to learn to do their job well, and the best companies or situations to start in.

A good place to start with these career chats or "informational interviews" is with people you know—or more likely, people you know who know people with jobs you find interesting. People you already know include your parents (of course), relatives, neighbors, friends' parents, people who belong to your place of worship or club, and so on.

All it takes to get the process going is gathering up all your nerve and asking these people for help. You'll find that nine and a half times out of 10, the people you encounter will be delighted to help, either by providing information about their careers or by introducing you to people they know who can help.



# **hints and tips for a successful interview**

## **● TIP #1**

**Think about your goals for the interview, and write them down.**

Be clear about what you want to know after the interview that you didn't know before it.

Remember that the questions for all personal interviews are not the same. You would probably use different questions to write a biography of the person, to evaluate him or her for a job, to do a history of the industry, or to learn about careers that might interest you.

Writing down your objectives will help you stay focused.

## **● TIP #2**

**Pay attention to how you phrase your questions.**

Some questions that we ask people are "closed" questions; we are looking for a clear answer, not an elaboration. "What time does the movie start?" is a good example of a closed question.

Sometimes, when we ask a closed question, we shortchange ourselves. Think about the difference between "What times are the showings tonight?" and "Is there a 9 P.M. showing?" By asking the second question, you may not find out if there is an 8:45 or 9:30 show.

That can be frustrating. It usually seems so obvious when we ask a question that we expect a full answer. It's important to remember, though, that the person hearing the question doesn't always have the same priorities or know why the question is being asked.

The best example of this? Think of the toddler who answers the phone. When the caller asks, "Is your mom home?" the toddler says, "Yes" and promptly hangs up. Did the child answer the question? As far as he's concerned, he did a great job!

Another problem with closed questions is that they sometimes require so many follow-up questions that the person being interviewed feels like a suspect in an interrogation room.

A series of closed questions may go this way:

***Q: What is your job title?***

A: Assistant Producer

***Q: How long have you had that title?***

A: About two years.

*Q: What was your title before that?*

*Q: How long did you have that title?*

*Q: What is the difference between the two jobs?*

*Q: What did you do before that?*

*Q: Where did you learn to do this job?*

*Q: How did you advance from one job to the next?*

An alternative, “open” question invites conversation. An open-question interview might begin this way:

*I understand you are an Assistant Producer. I’m really interested in what that job is all about and how you got to be at the level you are today.*

Open questions often begin with words like:

*Tell me about . . .*

*How do you feel about . . .*

*What was it like . . .*

## ● **TIP #3**

**Make the person feel comfortable answering truthfully.**

In general, people don’t want to say things that they think will make them look bad. How to get at the truth? Be empathic, and make their answers seem “normal.”

Ask a performer or artist how he or she feels about getting a bad review from the critics, and you are unlikely to hear, “It really hurts. Sometimes I just want to cry and get out of the business.” Or “Critics are so stupid. They never understand what I am trying to do.”

Try this approach instead: “So many people in your industry find it hard to deal with the hurt of a bad critical review. How do you handle it when that happens?”

# **ask the experts**

**Y**ou can learn a lot by interviewing people who are already successful in the types of careers you're interested in. In fact, we followed our own advice and interviewed several people who have been successful in the field of information technology to share with you here.

Before you get started on your own interview, take a few minutes to look through the results of some of ours. To make it easier for you to compare the responses of all the people we interviewed, we have presented our interviews as a panel discussion that reveals important success lessons these people have learned along the way. Each panelist is introduced on the next page.

Our interviewees gave us great information about things like what their jobs are really like, how they got to where they are, and even provided a bit of sage advice for people like you who are just getting started.

## **So Glad You Asked**

**In addition to the questions we asked in the interviews in this book, you might want to add some of these questions to your own interviews:**

- How did your childhood interests relate to your choice of career path?
- How did you first learn about the job you have today?
- In what ways is your job different from how you expected it to be?
- Tell me about the parts of your job that you really like.
- If you could get someone to take over part of your job for you, what aspect would you most like to give up?
- If anything were possible, how would you change your job description?
- What kinds of people do you usually meet in your work?
- Walk me through the whole process of getting your type of product made and distributed. Tell me about all the people who are involved.
- Tell me about the changes you have seen in your industry over the years. What do you see as the future of the industry?
- Are there things you would do differently in your career if you could do it all over?

# real people with real jobs in information technology

Following are introductions to our panel of experts. Get acquainted with their backgrounds and then use their job titles to track their stories throughout the eight success lessons.

- **Heather Bouton** is an **IT Manager** for a computer consulting firm called Bearing Point based in Indianapolis, Indiana.
- **Jay Coalson** is a **Computer Contractor** based in Colorado who designs and implements software solutions for large businesses. His work has taken him as far afield as Paris and into situations as diverse as a nuclear waste site and the Hurricane Hugo disaster in South Florida.
- **Dr. Marcia Kerchner** is **Principal Information Systems Architect** for the MITRE Corporation in McLean, Virginia.
- **Aaron Long** works as a **Network Engineer** for a Fortune 500 telecommunications company in California.
- **Gene Pirogovsky** is a **Senior Software Consultant** who was one of the original architects of a global payroll product that is used by businesses, governments, and educational institutions all over the world.
- **Todd Reid** is a **Technical Editor** for a software documentation team at Microsoft in Seattle, Washington.
- **Deborah Scherrer** is **Coordinator of Education and Public Outreach** for Stanford University in California.
- **Avi Stern** is a **Systems Architect** from Florida who designs and implements complex computer systems (including both software and hardware) for businesses and government.
- **Rachel Tsimmerman** works in Cleveland, Ohio, as a **Systems Analyst** for the U.S. Department of Defense.
- **Christian Vescia** is an **Instructional Designer** who specializes in designing on-line e-learning courses that are delivered over the World Wide Web.



Success Lesson #1:

## **Work is a good thing when you find the right career.**

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### **• What exactly does your current job involve?**

**IT Manager:** I provide consulting services across the entire systems development life cycle to include project management, business process reengineering, configuration management, data cleansing and conversion, data modeling, software selection, system implementation, system integration, and testing. My main role is in managing a team of consultants (employees and subcontractors). Managing a team involves staffing projects, coordinating with clients regarding staffing and scope of work, and managing project financials (budget, invoicing, and payments to subcontractors). In addition, my current job requires approximately 25 to 50 percent travel, but could require up to 100 percent, depending on the project.

**Computer Contractor:** My responsibilities include the design and implementation of solutions for businesses that are installing one of many software products developed by PeopleSoft, Inc. I am most often tasked with writing code to breach the gaps between what the PeopleSoft software was designed to do and the desired business practices of the client.

**Principal Information Systems Architect:** I work as a systems architect in the public interest, supporting government projects. The projects vary from requirements analysis to system architecture design to technology planning.

**Senior Software Consultant:** I implement a software program called PeopleSoft Global Payroll designed to calculate paychecks for big companies with a lot of employees. The product is very generic, so to make it work at a specific company, certain changes must be completed. Since I was one of the original architects of the product, my knowledge of the program gives me strong credentials.

**Network Engineer:** As a network engineer, I design, deploy, and maintain the computer equipment that makes the Internet work. I am currently responsible for core network infrastructure in several major cities in the United States.

**Technical Editor:** I work on a documentation team at Microsoft that produces software development kits that teach developers how to design and write software that will run on the Windows operating system.

**Coordinator of Education and Public Outreach:** Most of my career has been related to computers in either research or industry. About two years ago I had the great opportunity to get a job at Stanford University doing the education and public outreach

# **Everybody has to start some- where!**

Following is a list of first jobs once held by our esteemed panel of experts.

Bag boy

Medic

Busboy

Pizza maker

Assembly-line worker

Math tutor

Waitress

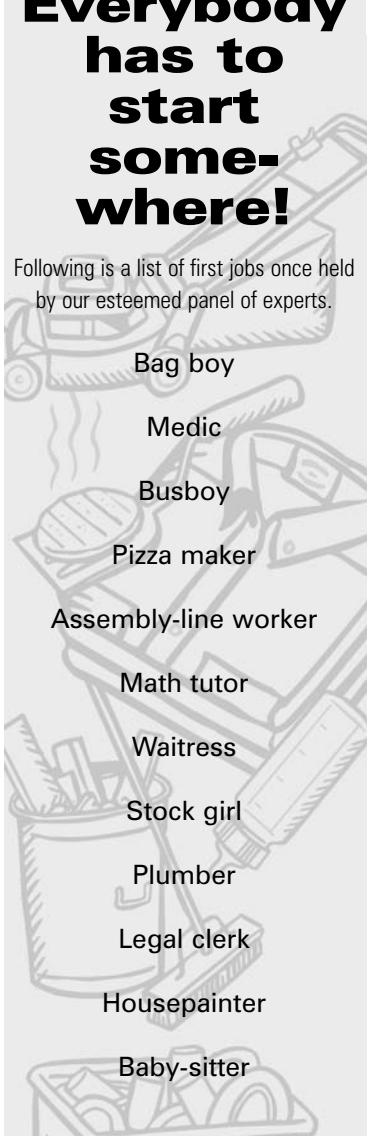
Stock girl

Plumber

Legal clerk

Housepainter

Baby-sitter



programs for their solar science group. So I left the computer science field and am now working in the theme of astronomy, my original career dream. I am still involved with the computer science world by volunteering for such organizations as the IEEE Computer Society and the Usenix Association. They allow me to stay involved with “the community” even though I’ve moved a bit far afield.

**Systems Architect:** I am a systems architect—that means I design and implement large complex computer systems. My role is usually trying to put the different technology pieces together according to the needs of the business. I am responsible for putting the right software, hardware, and methods in the proper hands. The job requires patience and persistence—what I do mostly is introduce new ideas and new ways to use technology to improve productivity.

**Systems Analyst:** My job consists of three parts: input, process, and output. Let’s say a customer needs a system that will produce a report with a yellow happy face as the title. The trick is, if a report’s summary is wrong (for example, amount of money is not matching the bank balance), the color of the happy face will become red and the expression will change to a sad face. This is a very simple example of what my job is. Mainly, it’s much more complicated than a happy face report. My job is to take the customer requirements and build the system (based on these requirements) that gives the customer satisfaction!

**Instructional Designer:** I design on-line learning courses that are delivered over the World Wide Web. The courses provide training to people who work in corporations and cover topics such as product training, application training, and safety training. After learning all I can about the client’s goals and objectives, I design activities for the course, write the course, and work with a developer to design the user interface and interactions for the Web.

## Success Lesson #2: **Career goals change and so do you.**

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### • **How did you end up doing what you’re now doing?**

**IT Manager:** I started with my company as a senior analyst as part of a consulting team and have worked my way up to manager over several years, and I now manage a consulting team. I gained consulting skills over the years and continued to broaden my knowledge regarding the overall systems development life cycle. In addition, I have continued to develop my leadership and management styles.



**Computer Contractor:** While in high school, I concentrated on having a good time at the expense of all responsible activity. It wasn't until I was in college that I began to focus on a career other than surfing. In college, I immediately gravitated toward psychology and soon found myself working as an assistant in the college's bio-feedback lab as well as training rats to do cartwheels at the sound of Pavlov's bell. My primary desire was to work in primate research. When I completed my BA degree, I applied to a number of graduate schools. While awaiting word from a graduate school I took a course in computer programming. Within a week of writing my first program I was hooked. The ability to create something (a program) that would have a life of its own (execute) was more than I could pass up. There was true "power" in programming.

**Principal Information Systems Architect:** At first I wanted to be a college professor. As I became more involved in computer science, commercial opportunities looked more interesting than an academic career.

**Senior Software Consultant:** My family immigrated to the United States when I was a sophomore in college. To support my wife and first child, I needed to quickly acquire a trade. Since I always like mathematics, computer programming seemed a good choice.

**Technical Editor:** I went to college to become a percussionist but quickly realized that I did not want to spend four years of college practicing the marimba. So I switched my major to English literature. After spending a couple years teaching at a community college and earning college-level certification in technical writing and editing, I was hired by Microsoft.

**Network Engineer:** I originally planned to be a computer animator but found that high job competition made for a dearth of entry-level opportunities. One summer I got a job doing Internet technical support. I enjoyed the work and the people I worked with a great deal and felt this was a field where my technical aptitude would garner better rewards faster than continuing to pursue a career in computer animation.

**Systems Analyst:** I was successfully working as an interior designer but decided that something was missing in my work. So I decided to try computers and started taking computer classes in the evenings.

**Coordinator of Education and Public Outreach:** I started out in music and even got a BA degree in it. But in graduate school at University of California–Berkeley, I started to learn about computers. I loved working with them, took some courses, worked really hard to get caught up, and ended up in the computer science field.

**Systems Architect:** I got bit by the “computer bug.”

**Instructional Designer:** When I was a teenager there wasn’t a World Wide Web and the term e-learning didn’t even exist. Before becoming an instructional designer, I worked in international banking, went to business school, sold computer software and hardware for IBM, and performed product management for multimedia authoring tool software. To make the transition from a business role, such as product manager, to a design role, I went back to school in the evenings to pursue a master’s in instructional media.

### Success Lesson #3:

## **There are good and bad things about every job.**

---

### • **What do you especially like about your job?**

**Computer Contractor:** The best part of my job is that I am still creating things that take on a life of their own—solutions that make both the client and me happy.

**Network Engineer:** The best part of working in network engineering is that it is a very important, technically demanding position, which few people are cut out to perform.

**Instructional Designer:** When I first got the job, I told my daughters that I got to “draw pictures” for my job. I love the creative aspect of designing engaging instructional activities and laying out screens.

**Senior Software Consultant:** The best, most interesting, part of the job is the challenge of making as few changes to the software as possible because every change is a potential headache down the road when new updates must be applied.

**Technical Editor:** I love the actual editing and I really enjoy being able to developmentally edit an overview-length document and shape it into a leaner, more usable document.

• **Your least favorite parts of your job?**

**Computer Contractor:** The worst part of the job is the travel that is sometimes involved. Many of my assignments have entailed weekly travel by air from my home to the client location. Also, eating in restaurants gets old pretty quickly as does not seeing my family.

**Senior Software Consultant:** The worst part of the job is sitting through numerous meetings and talking about minute, unimportant issues for hours.

**Technical Editor:** I've worked very hard to learn as much as I can about computer programming and about how our customers use our documentation but, honestly, I would prefer to be editing a music magazine or website!

**Network Engineer:** The worst part of the job is that the work I am doing is very important, and there can be an extremely high amount of scrutiny on the work I do. My employer is a Fortune 500 company, and the slightest mishap in my execution of my duties can have a direct and significant effect on our bottom line. The pressure to perform and keep my work free of any mistakes is very, very high.

**Instructional Designer:** When we are up against a tight deadline, we have to work some long days to get the job done.

Success Lesson #4:

**There's more than one way to get an education.**

• **Where did you learn the skills of your field, both formally (school) and informally (experience)?**

**IT Manager:** While in the military, I gained experience with network administration, troubleshooting systems to resolve problems, installation and implementation of new software and processes, and system security. Based on these experiences, I decided to obtain a master's degree in computer resources and information management.



**Senior Software Consultant:** I always enjoyed solving puzzles. And that is what computer programming is to me—solving puzzles. Every assignment is a riddle that can be solved elegantly and efficiently or pushed through in a cumbersome and wasteful manner.

**Systems Analyst:** I would say the life experience. The more “spikes” in life you have, the more desire you have to avoid them and find the better road.

**Principal Information Systems Architect:** The discipline required to complete my Ph.D. degree helped me develop skills of concentration and analysis that have served me very well since.

**Systems Architect:** In this career there is no clear education path so learning comes mostly through experience and flexibility. I have a computer science degree but my ability to think and resolve problems creatively is a skill I learned in other areas of my academics.

**Instructional Designer:** The most important skill I learned outside a classroom was how to listen.

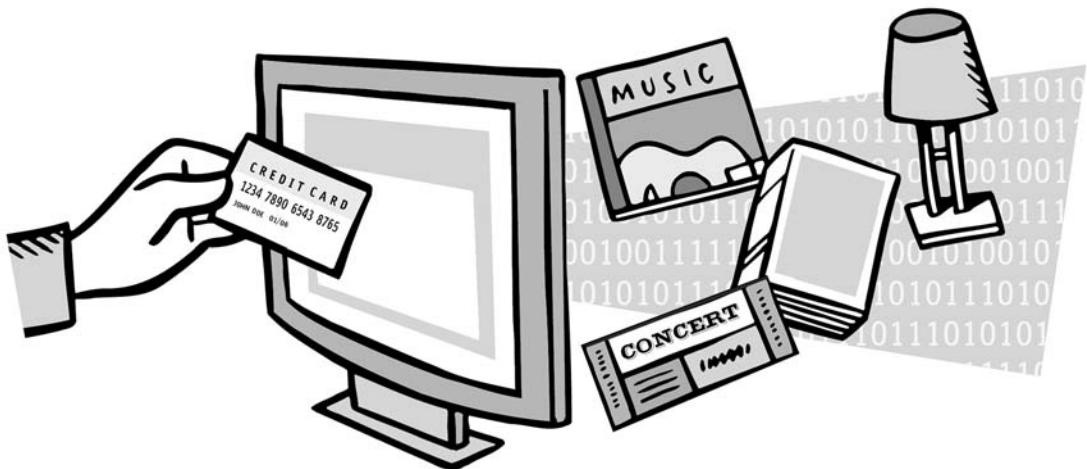
Success Lesson #5:  
**Good choices and hard work  
are a potent combination.**

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• **What are you most proud of in your career?**

**Computer Contractor:** Several things come to mind here.

I was able to spend nine months working in Paris and am currently designing part of the infrastructure surrounding the development of a new payroll system for the United States military. The State of Florida Army National Guard was the only guard unit on the ground in Iraq in the first gulf war due to the order-processing system we wrote. I was awarded the federal Commanders Award for Civilian Service for around-the-clock work during the Hurricane Hugo disaster in South Florida.



**Senior Software Consultant:** I created a software system that enabled a major credit card company to sift through billions of transactions in real time and resolve a customer complaint in a matter of minutes. Before this system, the research often took three to seven days to complete.

**Network Engineer:** In the three years I've been a network engineer, I've helped unify a diverse collection of regional Internet service providers into a nationwide network. I've built and rebuilt network facilities in three major U.S. cities. I've personally deployed well over 10 million dollars worth of network hardware, and facilitated the deployment of at least five times that much.

**Technical Editor:** Getting hired at Microsoft is something I'm particularly proud of. The interview process here is legendary, and mine took eight hours. I interviewed with seven different people

and by the end of the day I was toast! But I did well and was offered the job.

**Systems Analyst:** I am one of the first Russian immigrants to work for the U.S. Department of Defense!

**Coordinator of Education and Public Outreach:** In the mid-1990s I worked in this Stanford job for a couple of years before I went back to industry. During that period I developed a website (<http://solar-center.stanford.edu>) that many people enjoyed and that won a great many awards. I was very pleased to have been able to make a contribution that some thought significant.

Success Lesson #6:

## **It isn't really just what you know.**

- **Are there any people or significant events that especially helped you in your career?**

**Principal Information Systems Architect:** I took a math course in college that introduced me to computer science and the professor encouraged me to pursue the field.

**Systems Analyst:** My college advisor saw that I didn't have the drafting talent necessary to succeed in the school of architecture and suggested that I work on an experimental project that used computer-aided design instead.

Success Lesson #7:

## **You can learn from other people's mistakes.**

- **Is there anything you wish you had done differently?**

**Computer Contractor:** I have been consulting in computer software since 1981. I have owned two software development companies and three corporations. At the end of the day, I realize that I am a much better developer than administrator. The skills required to run a successful business are not necessarily coexistent with those required to provide software solutions. I much prefer the programming.

**Systems Architect:** Second-guessing is not part of the equation. But, sometimes I wish I was starting over because the opportunities and the technologies available now are by far broader than when I started.

**Technical Editor:** I wish I'd pursued a more traditional editing career like at a magazine; especially a magazine that wrote about some of my personal interests like drumming, music, boxing, or wine.

**Instructional Designer:** I wish I had figured out that I would enjoy this field much sooner than I did. My career path involved a lot of trial and error on the way.

Success Lesson #8:

## **A little advice goes a long way.**

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- **What advice do you have for a young person just getting started?**

**Computer Contractor:** Make sure you enjoy the process. Software consulting and the associated travel can be exciting. However, the work is demanding and the pressure can be crippling. You have got to enjoy the ride. That said, realize that the best way to learn is to try. Don't fear your mistakes. I have learned more and more quickly by my mistakes than by those things that worked the first time. The bottom line is that the more mistakes you make, the more you learn.

**Systems Architect:** Make sure your job is fun for you. If you drag into work day after day, maybe you need to reconsider your choice. Money may drive you to start but that chase becomes old. To me it is always the thrill of the "game" and as long as my career is more a game than a job, I am doing something right.

**Systems Analyst:** Prepare yourself for a journey into the unknown. Technology changes daily so don't be discouraged that you can't know everything. The field is full of excitement and challenge and it's worth it.

**Principal Information Systems Architect:** My career has allowed me to pursue both management and technical tracks and, in fact, the fact that I have been able to merge those responsibilities has made for an interesting career. The opportunities are great in my field. I encourage young people to get as much education as possible, particularly in technical areas, learn how to write well, and get as much experience as you can with a good mentor in the business.

**Coordinator of Education and Public Outreach:** If you want to go into computers, go for it! You'll need at least a bachelor of science degree but preferably a master's degree in one of the computer-related fields. Young people are probably aware by now that there are way more men in the computing industry than women.

In the earlier days of my career I remember counting at meetings, and there would be seven or eight women and 200 men. Although that may sound unbalanced, I actually enjoyed it quite a bit! As a woman in a man's field, I stood out, not because of any capabilities I might have had, but because seeing a woman in the field was so rare for most men. Yes, there were some very difficult times, but I still enjoyed it. I would strongly encourage any young woman interested in computing to go for it!



Big Activity #7:

## **who knows what you need to know?**

It's one thing to read about conducting an informational interview, but it's another thing altogether to actually do one. Now it's your turn to shine. Just follow these steps for doing it like a pro!

**Step 1:** Identify the people you want to talk to about their work.

**Step 2:** Set up a convenient time to meet in person or talk over the phone.

**Step 3:** Make up a list of questions that reflect things you'd really like to know about that person's work. Go for the open questions you just read about.

**Step 4:** Talk away! Take notes as your interviewee responds to each question.

**Step 5:** Use your notes to write up a "news" article that describes the person and his or her work.

**Step 6:** Place all your notes and the finished "news" article in your Big Question AnswerBook.

## Big Activity #7: **who knows what you need to know?**

contact information	appointments/sample questions
name	day _____ time _____
company	location _____
title	_____
address	_____
_____	sample questions:
phone	_____
email	_____
_____	_____
name	day _____ time _____
company	location _____
title	_____
address	_____
_____	sample questions:
phone	_____
email	_____
_____	_____
name	day _____ time _____
company	location _____
title	_____
address	_____
_____	sample questions:
phone	_____
email	_____
_____	_____

Big Activity #7: **who knows what you need to know?**

questions	answers

INTERVIEW NOTES

Big Activity #7: **who knows what you need to know?**

questions	answers

INTERVIEW NOTES

## Big Activity #7: **who knows what you need to know?**

# NEWS

## Big Activity #7: **who knows what you need to know?**

# NEWS



## Big Question #8: **how can you find out what a career is really like?**

**T**here are some things you just have to figure out for yourself. Things like whether your interest in pursuing a career in marine biology is practical if you plan to live near the Mojave Desert.

Other things you have to see for yourself. Words are sometimes not enough when it comes to conveying what a job is really like on a day-to-day basis—what it looks like, sounds like, and feels like.

Here are a few ideas for conducting an on-the-job reality check.

### **identify typical types of workplaces**

Think of all the places that jobs like the ones you like take place. Almost all of the careers in this book, or ones very similar to them, exist in the corporate world, in the public sector, and in the military. And don't forget the option of going into business for yourself!

For example: Are you interested in public relations? You can find a place for yourself in almost any sector of our economy. Of course, companies definitely want to promote their products. But don't limit yourself to the Fortune 500 corporate world. Hospitals, schools, and manufacturers need your services. Cities, states, and even countries also need your services. They want to increase tourism, get businesses to relocate there, and convince workers to live there or students to study there. Each military branch needs to recruit new members and to show how they are using the money they receive from the government for medical research, taking care of families, and other non-news-breaking uses. Charities, community organizations, and even religious groups want to promote the good things they are doing so that they will get more members, volunteers, contributions, and funding. Political candidates, parties, and special interest groups all want to promote their messages. Even actors, dancers, and writers need to promote themselves.

Not interested in public relations but know you want a career that involves lots of writing? You've thought about becoming the more obvious choices—novelist, newspaper reporter, or English teacher. But you don't want to overlook other interesting possibilities, do you?

What if you also enjoy technical challenges? Someone has to write the documentation for all those computer games and software.

Love cars? Someone has to write those owner's manuals too.

Ditto on those government reports about safety and environmental standards for industries.

Maybe community service is your thing. You can mix your love for helping people with writing grant proposals seeking funds for programs at hospitals, day care centers, or rehab centers.

Talented in art and design? Those graphics you see in magazine advertisements, on your shampoo bottle, and on a box of cereal all have to be created by someone.

That someone could be you.

## **find out about the job outlook**

Organizations like the U.S. Bureau of Labor Statistics spend a lot of time and energy gathering data on what kinds of jobs are most in demand now and what kinds are projected to be in demand in the future. Find out what the job outlook is for a career you like. A good resource for this data can be found on-line at America's Career InfoNet at [www.acinet.org/acinet](http://www.acinet.org/acinet).

This information will help you understand whether the career options you find most appealing are viable. In other words, job outlook data will give you a better sense of your chances of actually finding gainful employment in your chosen profession—a rather important consideration from any standpoint.

Be realistic. You may really, really want to be a film critic at a major newspaper. Maybe your ambition is to become the next Roger Ebert.

Think about this. How many major newspapers are there? Is it reasonable to pin all your career hopes on a job for which there are only about 10 positions in the whole country? That doesn't mean that it's impossible to achieve your ambition. After all, someone has to fill those positions. It should just temper your plans with realism and perhaps encourage you to have a back-up plan, just in case.

## **look at training requirements**

Understand what it takes to prepare yourself for a specific job. Some jobs require only a high school diploma. Others require a couple of years of technical training, while still others require four years or more in college.

Be sure to investigate a variety of training options. Look at training programs and colleges you may like to attend. Check out their websites to see what courses are required for the major you want. Make sure you're willing to "do the time" in school to prepare yourself for a particular occupation.

## **see for yourself**

There's nothing quite like seeing for yourself what a job is like. Talk with a teacher or guidance counselor to arrange a job-shadowing opportunity with someone who is in the job or in a similar one.

Job shadowing is an activity that involves actually spending time at work with someone to see what a particular job is like up close and personal. It's an increasingly popular option and your school may participate in specially designated job-shadowing days. For some especially informative resources on job shadowing, visit [www.jobshadow.org](http://www.jobshadow.org).

Another way to test-drive different careers is to find summer jobs and internships that are similar to the career you hope to pursue.

## **make a Plan B**

Think of the alternatives! Often it's not possible to have a full-time job in the field you love. Some jobs just don't pay enough to meet the needs of every person or family. Maybe you recognize that you don't have the talent, drive, or commitment to rise to the top. Or, perhaps you can't afford the years of work it takes to get established or you place a higher priority on spending time with family than that career might allow.

If you can see yourself in any of those categories, DO NOT GIVE UP on what you love! There is always more than one way to live out your dreams. Look at some of the other possibilities in this book. Find a way to integrate your passion into other jobs or your free time.

Lots of people manage to accomplish this in some fairly impressive ways. For instance, the Knicks City Dancers, known for their incredible performances and for pumping up the crowd at Knicks basketball games, include an environmental engineer, a TV news assignment editor, and a premed student, in addition to professional dancers. The Broadband Pickers, a North Texas bluegrass band, is made up of five lawyers and one businessman. In fact, even people who are extremely successful in a field that they love find ways to indulge their other passions. Paul Newman, the actor and director, not only drives race cars as a hobby, but also produces a line of gourmet foods and donates the profits to charity.

Get the picture? Good. Hang in there and keep moving forward in your quest to find your way toward a great future.



Big Activity #8:

## **how can you find out what a career is really like?**

This activity will help you conduct a reality check about your future career in two ways. First, it prompts you to find out more about the nitty-gritty details you really need to know to make a well-informed career choice. Second, it helps you identify strategies for getting a firsthand look at what it's like to work in a given profession—day in and day out.

Here's how to get started:

**Step 1:** Write the name of the career you're considering at the top of a sheet of paper (or use the following worksheets if this is your book).

**Step 2:** Create a checklist (or, if this is your book, use the one provided on the following pages) covering two types of reality-check items.

**First, list four types of information to investigate:**

- training requirements
- typical workplaces
- job outlook
- similar occupations

**Second, list three types of opportunities to pursue:**

- job shadowing
- apprenticeship
- internship

**Step 3:** Use resources such as America's Career InfoNet at [www.acinet.org](http://www.acinet.org) and Career OneStop at [www.careeronestop.org](http://www.careeronestop.org) to seek out the information you need.

**Step 4:** Make an appointment with your school guidance counselor to discuss how to pursue hands-on opportunities to learn more about this occupation. Use the space provided on the following worksheets to jot down preliminary contact information and a brief summary of why or why not each career is right for you.

**Step 5:** When you're finished, place these notes in your Big Question AnswerBook.

Big Activity #8: **how can you find out  
what a career is really like?**

<b>career choice:</b>	
<b>training requirements</b>	
<b>typical workplaces</b>	
<b>job outlook</b>	
<b>similar occupations</b>	

INFORMATION

## Big Activity #8: **how can you find out what a career is really like?**

<b>job shadowing</b>	when:  where:  who:  observations and impressions:
<b>apprenticeship</b>	when:  where:  who:  observations and impressions:
<b>internship</b>	when:  where:  who:  observations and impressions:

OPPORTUNITIES

# Big Question #9: how do you know when you've made the right choice?

**W**hen it comes right down to it, finding the career that's right for you is like shopping in a mall with 12,000 different stores. Finding the right fit may require trying on lots of different options.

All the Big Questions you've answered so far have been designed to expand your career horizons and help you clarify what you really want in a career. The next step is to see how well you've managed to integrate your interests, capabilities, goals, and ambitions with the realities of specific opportunities.

There are two things for you to keep in mind as you do this.

**First**, recognize the value of all the hard work you did to get to this point. If you've already completed the first eight activities thoughtfully and honestly, whatever choices you make will be based on solid knowledge about yourself and your options. You've learned to use a process that works just as well now, when you're trying to get an inkling of what you want to do with your life, as it will later when you have solid job offers on the table and need to make decisions that will affect your life and family.

**Second**, always remember that sometimes, even when you do everything right, things don't turn out the way you'd planned. That's called life. It happens. And it's not the end of the world. Even if you make what seems to be a bad choice, know this—there's no such thing as a wasted experience. The paths you take, the training you receive, the people you meet—they ultimately fall together like puzzle pieces to make you who you are and prepare you for what you're meant to do.

That said, here's a strategy to help you confirm that you are making the very best choices you can.





Big Activity #9:

## how do you know when you've made the right choice?

One way to confirm that the choices you are making are right for you is to look at both sides of this proverbial coin: what you are looking for and what each career offers. The following activity will help you think this through.

**Step 1:** To get started, make two charts with four columns (or, if this is your book, use the following worksheets).

**Step 2:** Label the first column of the first chart as “Yes Please!” Under this heading list all the qualities you absolutely must have in a future job. This might include factors such as the kind of training you'd prefer to pursue (college, apprenticeship, etc.); the type of place where you'd like to work (big office, high-tech lab, in the great outdoors, etc.); and the sorts of people you want to work with (children, adults, people with certain needs, etc.). It may also include salary requirements or dress code preferences.

**Step 3:** Now at the top of the next three columns write the names of three careers you are considering. (This is a little like Big Activity #3 where you examined your work values. But now you know a lot more and you're ready to zero in on specific careers.)

**Step 4:** Go down the list and use an *X* to indicate careers that do indeed feature the desired preferences. Use an *O* to indicate those that do not.

**Step 5:** Tally up the number of *Xs* and *Os* at the bottom of each career column to find out which comes closest to your ideal job.

**Step 6:** In the first column of the second chart add a heading called “No Thanks!” This is where you'll record the factors you simply prefer not to deal with. Maybe long hours, physically demanding work, or jobs that require years of advanced training just don't cut it for you. Remember that part of figuring out what you do want to do involves understanding what you don't want to do.

**Step 7:** Repeat steps 2 through 5 for these avoid-at-all-costs preferences as you did for the must-have preferences above.

## Big Activity #9: **how do you know when you've made the right choice?**

## Big Activity #9: **how do you know when you've made the right choice?**



## Big Question #10: **what's next?**

**T**hink of this experience as time well invested in your future. And I expect it to pay off in a big way down the road. By now, you have worked (and perhaps wrestled) your way through nine important questions:

- ❑ Big Question #1: **who are you?**
- ❑ Big Question #2: **what are your interests and strengths?**
- ❑ Big Question #3: **what are your work values?**
- ❑ Big Question #4: **what is your work personality?**
- ❑ Big Question #5: **do you have the right skills?**
- ❑ Big Question #6: **are you on the right path?**
- ❑ Big Question #7: **who knows what you need to know?**
- ❑ Big Question #8: **how can you find out what a career is really like?**
- ❑ Big Question #9: **how do you know when you've made the right choice?**

But what if you still don't have a clue about what you want to do with your life?

Don't worry. You're talking about one of the biggest life decisions you'll ever make. These things take time.

It's okay if you don't have all the definitive answers yet. At least you do know how to go about finding them. The process you've used to work through this book is one that you can rely on throughout your life to help you sort through the options and make sound career decisions.

So what's next?

More discoveries, more exploration, and more experimenting with success are what come next. Keep at it and you're sure to find your way to wherever your dreams and ambitions lead you.

And, just for good measure, here's one more Big Activity to help point you in the right direction.



## Big Activity #10: **what's next?**

List five things you can do to move forward in your career planning process (use a separate sheet if you need to). Your list may include tasks such as talking to your guidance counselor about resources your school makes available, checking out colleges or other types of training programs that can prepare you for your life's work, or finding out about job-shadowing or internship opportunities in your community. Remember to include any appropriate suggestions from the Get Started Now! list included with each career profile in Section 2 of this book.



Big Activity #10: **what's next?**

**career planning to-do list**

1

2

3

4

5

# **a final word**

**Y**ou are now officially equipped with the tools you need to track down a personally appropriate profession any time you have the need or desire. You've discovered more about who you are and what you want. You've explored a variety of career options within a very important industry. You've even taken it upon yourself to experiment with what it might be like to actually work in certain occupations.

Now it's up to you to put all this newfound knowledge to work for you. While you're at it, here's one more thing to keep in mind: Always remember that there's no such thing as a wasted experience. Certainly some experiences are more positive than others, but they all teach us something.

Chances are you may not get everything right the first time out. It may turn out that you were incorrect about how much you would love to go to a certain college or pursue a particular profession. That doesn't mean you're doomed to failure. It simply means that you've lived and learned. Sometimes you just won't know for sure about one direction or another until you try things out a bit. Nothing about your future has to be written in stone. Allow yourself some freedom to experiment with various options until you find something that really clicks for you.

Figuring out what you want to do with the rest of your life is a big deal. It's probably one of the most exciting and among the most intimidating decisions you'll ever make. It's a decision that warrants clear-headed thought and wholehearted investigation. It's a process that's likely to take you places you never dared imagine if you open yourself up to all the possibilities. Take a chance on yourself and seek out and follow your most valued hopes and dreams into the workplace.

Best wishes for a bright future!



# **Appendix**

## **a virtual support team**

As you continue your quest to determine just what it is you want to do with your life, you'll find that you are not alone. There are many people and organizations who want to help you succeed. Here are two words of advice—let them! Take advantage of all the wonderful resources so readily available to you.

The first place to start is your school's guidance center. There you are quite likely to find a variety of free resources which include information about careers, colleges, and other types of training opportunities; details about interesting events, job shadowing activities, and internship options; and access to useful career assessment tools.

In addition, since you are the very first generation on the face of the earth to have access to a world of information just the click of a mouse away—use it! The following Internet resources provide all kinds of information and ideas that can help you find your future.

## **make an informed choice**

Following are five of the very best career-oriented websites currently on-line. Be sure to bookmark these websites and visit them often as you consider various career options.

### **America's Career Info Net [www.acinet.org/acinet/default.asp](http://www.acinet.org/acinet/default.asp)**

Quite possibly the most comprehensive source of career exploration anywhere, this U.S. Department of Labor website includes all kinds of current information about wages, market conditions, employers, and employment trends. Make sure to visit the site's career video library where you'll find links to over 450 videos featuring real people doing real jobs.

### **Careers & Colleges [www.careersandcolleges.com](http://www.careersandcolleges.com)**

Each year Careers & Colleges publishes four editions of *Careers & Colleges* magazine, designed to help high school students set and meet their academic, career, and financial goals. Ask your guidance counselor about receiving free copies. You'll also want to visit the excellent Careers and Colleges website. Here you'll encounter their "Virtual Guidance Counselor," an interactive career database that allows you to match your interests with college majors or careers that are right for you.

### **Career Voyages [www.careervoyages.gov](http://www.careervoyages.gov)**

This website is brought to you compliments of collaboration between the U.S. Department of Labor and the U.S. Department of Education and is designed especially for students like you. Here you'll find infor-

mation on high-growth, high-demand occupations and the skills and education needed to attain those jobs.

**Job Shadow** [www.jobshadow.org](http://www.jobshadow.org)

See your future via a variety of on-line virtual job-shadowing videos and interviews featuring people with fascinating jobs.

**My Cool Career** [www.mycoolcareer.com](http://www.mycoolcareer.com)

This website touts itself as the “coolest career dream site for teens and 20’s.” See for yourself as you work your way through a variety of useful self-assessment quizzes, listen to an assortment of on-line career shows, and explore all kinds of career resources.

## investigate local opportunities

To get a better understanding of employment happenings in your state, visit these state-specific career information websites.

**Alabama**

[www.ajb.org/al](http://www.ajb.org/al)

[www.al.plusjobs.com](http://www.al.plusjobs.com)

**Connecticut**

[www1.ctdol.state.ct.us/jcc](http://www1.ctdol.state.ct.us/jcc)

[www.ctdol.state.ct.us/lmi](http://www.ctdol.state.ct.us/lmi)

**Alaska**

[www.jobs.state.ak.us](http://www.jobs.state.ak.us)

[www.akcis.org/default.htm](http://www.akcis.org/default.htm)

**Delaware**

[www.ajb.org/de](http://www.ajb.org/de)

[www.delawareworks.com](http://www.delawareworks.com)

**Arizona**

[www.ajb.org/az](http://www.ajb.org/az)

[www.adel.state.az.us/cte/](http://www.adel.state.az.us/cte/)

[AZCrnproject10.asp](http://AZCrnproject10.asp)

**District of Columbia**

[www.ajb.org/dc](http://www.ajb.org/dc)

[www.dcnetworks.org](http://www.dcnetworks.org)

**Arkansas**

[www.ajb.org/ar](http://www.ajb.org/ar)

[www.careerwatch.org](http://www.careerwatch.org)

[www.ioscar.org/ar](http://www.ioscar.org/ar)

**Florida**

[www.Florida.access.bridges.com](http://www.Florida.access.bridges.com)

[www.employflorida.net](http://www.employflorida.net)

**California**

[www.calmis.ca.gov](http://www.calmis.ca.gov)

[www.ajb.org/ca](http://www.ajb.org/ca)

[www.eurekanet.org](http://www.eurekanet.org)

**Georgia**

[www.gcic.peachnet.edu](http://www.gcic.peachnet.edu)

(Ask your school guidance counselor for your school's free password and access code)

[www.dol.state.ga.us/js](http://www.dol.state.ga.us/js)

**Colorado**

[www.coloradocareer.net](http://www.coloradocareer.net)

[www.coworkforce.com/lmi](http://www.coworkforce.com/lmi)

**Hawaii**

[www.ajb.org/hi](http://www.ajb.org/hi)

[www.careerkokua.org](http://www.careerkokua.org)

<b>Idaho</b> <a href="http://www.ajb.org/id">www.ajb.org/id</a> <a href="http://www.cis.idaho.gov">www.cis.idaho.gov</a>	<b>Minnesota</b> <a href="http://www.ajb.org/mn">www.ajb.org/mn</a> <a href="http://www.iseek.org">www.iseek.org</a>
<b>Illinois</b> <a href="http://www.ajb.org/il">www.ajb.org/il</a> <a href="http://www.ilworkinfo.com">www.ilworkinfo.com</a>	<b>Mississippi</b> <a href="http://www.ajb.org/ms">www.ajb.org/ms</a> <a href="http://www.mscacernet.org">www.mscacernet.org</a>
<b>Indiana</b> <a href="http://www.ajb.org/in">www.ajb.org/in</a> <a href="http://icpac.indiana.edu">http://icpac.indiana.edu</a>	<b>Missouri</b> <a href="http://www.ajb.org/mo">www.ajb.org/mo</a> <a href="http://www.greathires.org">www.greathires.org</a>
<b>Iowa</b> <a href="http://www.ajb.org/ia">www.ajb.org/ia</a> <a href="http://www.state.ia.us/iccor">www.state.ia.us/iccor</a>	<b>Montana</b> <a href="http://www.ajb.org/mt">www.ajb.org/mt</a> <a href="http://jsd.dli.state.mt.us/mjshome.asp">http://jsd.dli.state.mt.us/mjshome.asp</a>
<b>Kansas</b> <a href="http://www.ajb.org/ks">www.ajb.org/ks</a> <a href="http://www.kansasjoblink.com/ada">www.kansasjoblink.com/ada</a>	<b>Nebraska</b> <a href="http://www.ajb.org/ne">www.ajb.org/ne</a> <a href="http://www.careerlink.org">www.careerlink.org</a>
<b>Kentucky</b> <a href="http://www.ajb.org/ky">www.ajb.org/ky</a>	<b>New Hampshire</b> <a href="http://www.nhes.state.nh.us">www.nhes.state.nh.us</a>
<b>Louisiana</b> <a href="http://www.ajb.org/la">www.ajb.org/la</a> <a href="http://www.idol.state.la.us/jobpage.asp">www.idol.state.la.us/jobpage.asp</a>	<b>New Jersey</b> <a href="http://www.ajb.org/nj">www.ajb.org/nj</a> <a href="http://www.wnjpin.net/coei">www.wnjpin.net/coei</a>
<b>Maine</b> <a href="http://www.ajb.org/me">www.ajb.org/me</a> <a href="http://www.maine.gov/labor/lmis">www.maine.gov/labor/lmis</a>	<b>New Mexico</b> <a href="http://www.ajb.org/nm">www.ajb.org/nm</a> <a href="http://www.dol.state.nm.us/soicc/upto21.html">www.dol.state.nm.us/soicc/upto21.html</a>
<b>Maryland</b> <a href="http://www.ajb.org/md">www.ajb.org/md</a> <a href="http://www.careernet.state.md.us">www.careernet.state.md.us</a>	<b>Nevada</b> <a href="http://www.ajb.org/nv">www.ajb.org/nv</a> <a href="http://nvcis.intocareers.org">http://nvcis.intocareers.org</a>
<b>Massachusetts</b> <a href="http://www.ajb.org/ma">www.ajb.org/ma</a> <a href="http://masscis.intocareers.org">http://masscis.intocareers.org</a>	<b>New York</b> <a href="http://www.ajb.org/ny">www.ajb.org/ny</a> <a href="http://www.nycareerzone.org">www.nycareerzone.org</a>
<b>Michigan</b> <a href="http://www.mois.org">www.mois.org</a>	<b>North Carolina</b> <a href="http://www.ajb.org/nc">www.ajb.org/nc</a> <a href="http://www.ncsoicc.org">www.ncsoicc.org</a> <a href="http://www.ncccareers.org">www.ncccareers.org</a>

<b>North Dakota</b> <a href="http://www.ajb.org/nd">www.ajb.org/nd</a> <a href="http://www.imaginend.com">www.imaginend.com</a> <a href="http://www.ndcrn.com/students">www.ndcrn.com/students</a>	<b>Utah</b> <a href="http://www.ajb.org/ut">www.ajb.org/ut</a> <a href="http://jobs.utah.gov/wi/occi.asp">http://jobs.utah.gov/wi/occi.asp</a>
<b>Ohio</b> <a href="http://www.ajb.org/oh">www.ajb.org/oh</a> <a href="https://scoti.ohio.gov/scoti_jexs">https://scoti.ohio.gov/scoti_jexs</a>	<b>Vermont</b> <a href="http://www.ajb.org/vt">www.ajb.org/vt</a> <a href="http://www.vermontjoblink.com">www.vermontjoblink.com</a> <a href="http://www.vtlmi.info/oic.cfm">www.vtlmi.info/oic.cfm</a>
<b>Oklahoma</b> <a href="http://www.ajb.org/ok">www.ajb.org/ok</a> <a href="http://www.okcareertech.org/guidance">www.okcareertech.org/guidance</a> <a href="http://okcrn.org">http://okcrn.org</a>	<b>Virginia</b> <a href="http://www.ajb.org/va">www.ajb.org/va</a> <a href="http://www.vacrn.net">www.vacrn.net</a>
<b>Oregon</b> <a href="http://www.hsd.k12.or.us/crls">www.hsd.k12.or.us/crls</a>	<b>Washington</b> <a href="http://www.ajb.org/wa">www.ajb.org/wa</a> <a href="http://www.workforceexplorer.com">www.workforceexplorer.com</a> <a href="http://www.wa.gov/esd/lmea/soicc/sohome.htm">www.wa.gov/esd/lmea/soicc/sohome.htm</a>
<b>Pennsylvania</b> <a href="http://www.ajb.org/pa">www.ajb.org/pa</a> <a href="http://www.pacareerlink.state.pa.us">www.pacareerlink.state.pa.us</a>	<b>West Virginia</b> <a href="http://www.ajb.org/wv">www.ajb.org/wv</a> <a href="http://www.state.wv.us/bep/lmi">www.state.wv.us/bep/lmi</a>
<b>Rhode Island</b> <a href="http://www.ajb.org/ri">www.ajb.org/ri</a> <a href="http://www.dlt.ri.gov/lmi/jobseeker.htm">www.dlt.ri.gov/lmi/jobseeker.htm</a>	<b>Wisconsin</b> <a href="http://www.ajb.org/wi">www.ajb.org/wi</a> <a href="http://www.careers4wi.wisc.edu">www.careers4wi.wisc.edu</a> <a href="http://wiscareers.wisc.edu/splash.asp">http://wiscareers.wisc.edu/splash.asp</a>
<b>South Carolina</b> <a href="http://www.ajb.org/sc">www.ajb.org/sc</a> <a href="http://www.scois.org/students.htm">www.scois.org/students.htm</a>	<b>Wyoming</b> <a href="http://www.ajb.org/wy">www.ajb.org/wy</a> <a href="http://uwadmnweb.uwyo.edu/SEO/wcis.htm">http://uwadmnweb.uwyo.edu/SEO/wcis.htm</a>
<b>South Dakota</b> <a href="http://www.ajb.org/sd">www.ajb.org/sd</a>	
<b>Tennessee</b> <a href="http://www.ajb.org/tn">www.ajb.org/tn</a> <a href="http://www.tcids.utk.edu">www.tcids.utk.edu</a>	
<b>Texas</b> <a href="http://www.ajb.org/tx">www.ajb.org/tx</a> <a href="http://www.ioscar.org/tx">www.ioscar.org/tx</a> <a href="http://www.cdr.state.tx.us/Hotline/Hotline.html">www.cdr.state.tx.us/Hotline/Hotline.html</a>	

## **get a job**

Whether you're curious about the kinds of jobs currently in big demand or you're actually looking for a job, the following websites are a great place to do some virtual job-hunting.

### **America's Job Bank [www.ajb.org](http://www.ajb.org)**

Another example of your (or, more accurately, your parent's) tax dollars at work, this well-organized website is sponsored by the U.S. Department of Labor. Job seekers can post resumes and use the site's search engines to search through over a million job listings by location or by job type.

### **Monster.com [www.monster.com](http://www.monster.com)**

One of the Internet's most widely used employment websites, this is where you can search for specific types of jobs in specific parts of the country, network with millions of people, and find useful career advice.

## **explore by special interests**

An especially effective way to explore career options is to look at careers associated with a personal interest or fascination with a certain type of industry. The following websites help you narrow down your options in a focused way.

### **What Interests You? [www.bls.gov/k12](http://www.bls.gov/k12)**

This Bureau of Labor Statistics website provides information about careers associated with 12 special interest areas: math, reading, science, social studies, music and arts, building and fixing things, helping people, computers, law, managing money, sports, and nature.

### **Construct My Future [www.constructmyfuture.com](http://www.constructmyfuture.com)**

With over \$600 billion annually devoted to new construction projects, about 6 million Americans build careers in this industry. This website, sponsored by the Association of Equipment Distributors, the Association of Equipment Manufacturers, and Associated General Contractors, introduces an interesting array of construction-related professions.

### **Dream It Do It [www.dreamit-doit.com](http://www.dreamit-doit.com)**

In order to make manufacturing a preferred career choice by 2010, the National Association of Manufacturing's Center for Workforce Success is reaching out to young adults and their parents, educators, communities, and policy-makers to change their minds about manufacturing's future and its careers. This website introduces high-demand 21st-century manufacturing professions many will find surprising and worthy of serious consideration.

**Get Tech** [www.gettech.org](http://www.gettech.org)

Another award-winning website from the National Association of Manufacturing.

**Take Another Look** [www.Nrf.com/content/foundation/rcp/main.htm](http://www.Nrf.com/content/foundation/rcp/main.htm)

The National Retail Federation challenges students to take another look at their industry by introducing a wide variety of careers associated with marketing and advertising, store management, sales, distribution and logistics, e-commerce, and more.

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